

4.0 AFFECTED ENVIRONMENT

4.1 INTRODUCTION

This chapter presents the environmental conditions of the JPG and its Region of Influence (ROI). It provides information to serve as a baseline from which to identify and evaluate environmental changes resulting from disposal and reuse of the installation.

Natural and cultural resource categories were established to provide a framework of the identification of baseline conditions and the effects of the proposed actions on these conditions within each of the 12 EIS study areas. These resource categories were developed based on a review of installation resources, related resource protection laws and regulations, and comments received from the public and resource agencies during the EIS scoping process. The resource categories are land use; socioeconomics and community facilities; public health and safety; utilities and solid waste; visual resources; cultural resources; traffic and transportation; noise; air quality; geology, soils, and topography; biological resources; water resources; and hazardous materials and hazardous wastes.

4.2 LAND USE

4.2.1 Historical Overview

On October 8, 1940, the War Department established a 55,264-acre tract of land in southeast Indiana known as the Jefferson Proving Ground. Assigned to the Ordnance Department, Army Services Forces, the installation's principal mission was the production acceptance and specification testing of all types of ammunition, projectiles, propellants, cartridge cases, primers, fuses, boosters, bombs, and grenades. The JPG operations began in May 1941. Peak periods of activity occurred during World War II, the Korean War, and the Vietnam War. Maximum production testing of 175,000 rounds per month and highest employment at 1,774 personnel were reached in support of the Korean War in 1953.

Following each period of conflict, activities at the JPG significantly decreased. After World War II, the JPG became a subinstallation to the Indiana Arsenal and was briefly placed on standby status. From 1958-1961 it was again placed on standby status and partially deactivated, with some facilities leased to the private sector. In the early 1980s, increased emphasis on national defense, readiness capability, and conventional warfare brought about modest increases and diversification in production acceptance testing. Just prior to notification of closure in 1988, the JPG was in the process of increasing its productivity by 25 percent and planning to modernize its facilities. (USACOE 1991)

In December 1988, the JPG was included on the Secretary of Defense's ad hoc Commission on Base Realignment and Closure Final Report for Closure of Department of Defense installations. Upon notification of closure in 1989, the JPG employed approximately 450 personnel. As of late 1994, the installation employed approximately 180 personnel.

4.2.2 Location and Installation Land Use

The JPG facility occupies land in a rural agricultural area in southeastern Indiana, approximately eight miles from the Indiana-Kentucky border. The installation runs north to south for approximately 17 miles and varies from four to six miles in width. The perimeter is completely fenced. The base lies within Jefferson, Jennings, and Ripley Counties. The nearest major interstate highways are I-75 and I-65, located approximately 30 miles to the south and west, respectively. The installation is centrally located between three major cities: Indianapolis is about 88 miles northwest of the installation, Louisville, Kentucky, is

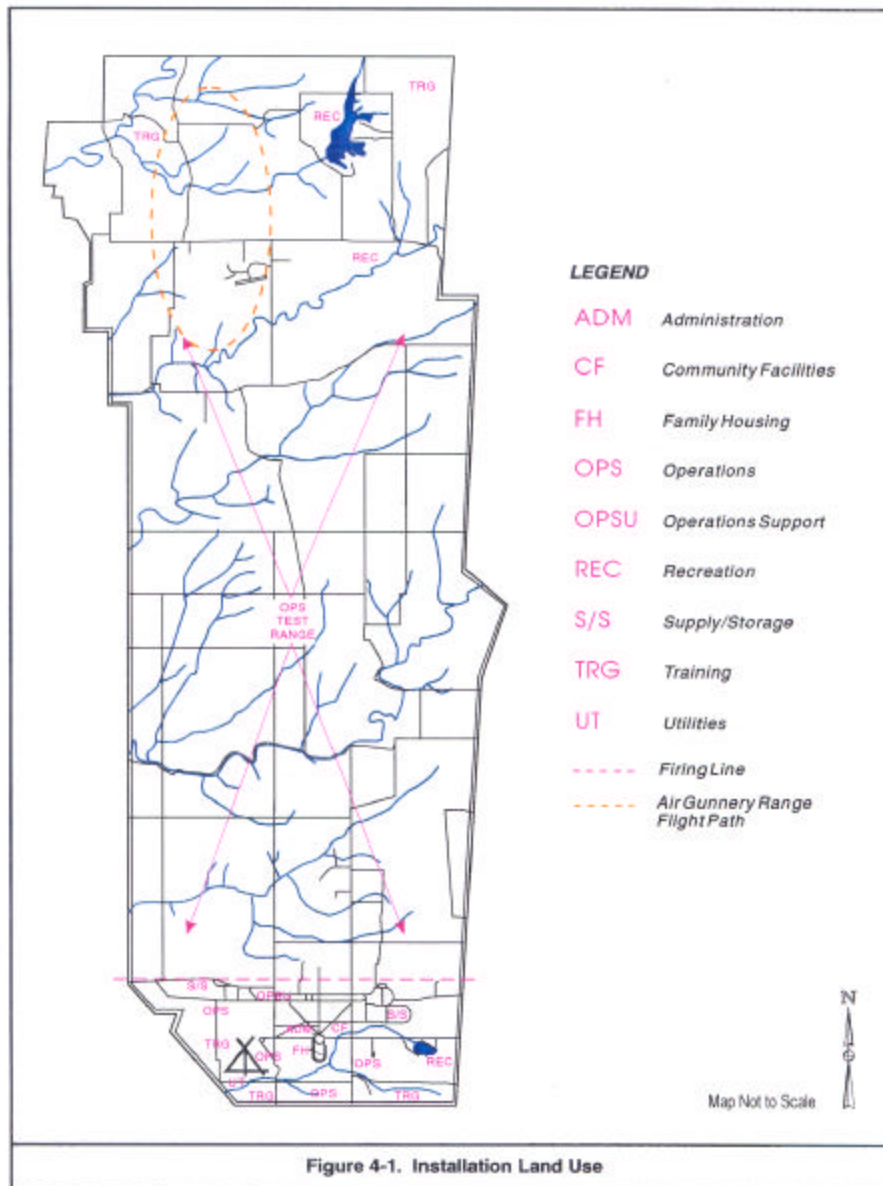
approximately 45 miles to the southwest, and Cincinnati, Ohio, is about 70 miles east of the JPG. Historic Madison, Indiana, is about six miles south of the cantonment area along the banks of the Ohio River.

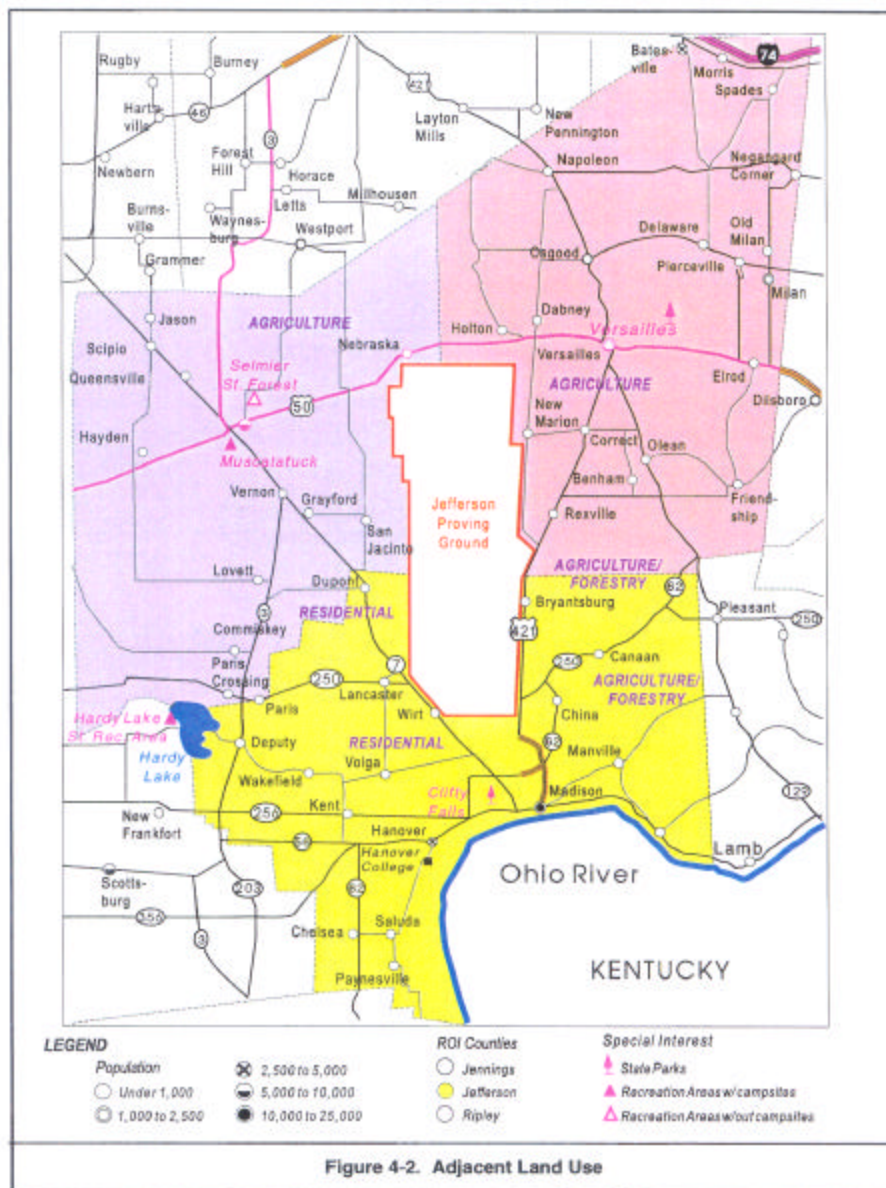
The installation is divided into two areas, the cantonment area and the area north of the firing line. The firing line demarcates the impact area from the operations and administrative area. Approximately 1,600 acres, or three percent, of the JPG facility is improved land. The majority of the land north of the firing line is unimproved and is used primarily as the impact area for ordnance testing. Nearly all of the 1,600 acres of improved land lies south of the firing line in the cantonment area, where operations, operational support, and administrative support activities occur. Operational uses directly supporting the installations mission account for more than ninety-seven percent of all land uses on the JPG facility. These include industrial activities such as maintenance and utilities, the safety zone, and the test ranges. The remaining three percent of land use includes training, supply and storage, recreation, administration, community support, a small medical facility, and 13 family housing units. While about one tenth of one percent of the JPG's total land area is designated for recreational use, installation employees and others with approved privileges take full advantage of the substantial natural resources which exist within the facility boundaries. Some 30,000 acres are available on a controlled-access basis for dispersed outdoor recreational activities such as hunting, fishing, and camping. Hunting and fishing opportunities are concentrated in the northeastern portion of JPG. Water recreation and picnicking are permitted at many of the ponds, lakes, and streams on the JPG property. Old Timbers Lake, which was built by JPG employees and encompasses 165 acres, is a favorite fishing and boating location for installation employees and residents. In addition, camping is available at Krueger Lake and the Old Timbers Lodge area. (USACOE 1991 and USATHAMA 1992). Figure 4-1 identifies various land uses of the facility.

4.2.3 Adjacent Land Use

Prior to its purchase by the Army, the JPG property was comprised of rural communities and agricultural land of Jefferson, Jennings, and Ripley Counties. Adjacent land use has changed very little since establishment of the JPG in 1940. The primary land uses of the tri-county region are agriculture, forestry, and residential (Figure 42). Table 41 summarizes land use for all three counties. The communities just outside of the JPG facility are generally small and unincorporated. The City of Madison, having a population of about 12,000, is the most highly developed area in the immediate vicinity of the JPG (U.S. Department of Commerce 1990). In recent years, sparse strips of residential and agricultural development have developed along major roads and highways around the JPG. Clifty Falls State Park, along the Ohio River, is south of the JPG and west of Madison. (USACOE 1991 and USATHAMA 1992).

Table 4-1. Adjacent Land Uses in the Vicinity of the JPG.							
County	Square Miles	Acres	Built-Up	Agriculture I	Forest	JPG	Water
Jefferson	366	234 240	4	61	25	9	1
Ripley	442	282 880	4	65	20	10	1
Jennings	377	241280	3	76	16	4	1





4.3 SOCIOECONOMICS AND COMMUNITY FACILITIES

4.3.1 Jefferson Proving Ground

At the time of the decision to close the JPG, the installation was authorized 14 military and 407 civilian employee positions; 47 military personnel and dependents lived on base.

The JPG family housing area consists of 13 units located in the center of the cantonment area around Officers Quarters Road. The units are farmhouses which were relocated on the JPG in 1941. Most of the units were originally built between 1900 and 1920. Each of the 13 units is a unique floor plan: one has five bedrooms, six have four bedrooms, five have three bedrooms, and one has two bedrooms. The units, consisting of wood frame construction to which aluminum siding has been added, are typical of farmhouse style throughout southern Indiana. Twelve of the units are heated by fuel oil-fired boilers and one set of quarters has an oil-fired forced air furnace. None have central air conditioning. All the units have individual electric meters. The units are generally in fair condition. Included in the family housing area are fourteen detached storage buildings for residential use and ten detached garages.

There are no DoD Dependent Schools on the installation. Dependents of military and civilian personnel working at the JPG attend school in one of the school districts in the vicinity of the installation.

In the past, JPG provided a contractor operated cafeteria in Building 149. The cafeteria was closed in 1993 due to the reduction in force accompanying the JPG's realignment of functions and personnel. There are no other retail shops or services such as commissary, post exchange, service station, or drycleaner available on the base. A variety of shops and services are available in the surrounding communities.

Recreational areas on the installation include a developed picnic, ballfield, and tennis court area, as well as Krueger Lake and Old Timbers Lake. Krueger Lake, located in the southeastern portion of the JPG facility, provides picnic facilities and camping sites. Old Timbers Lodge, located in the northeastern portion of the installation, is used by the JPG personnel and their families as a weekend retreat during the warm weather months. Old Timbers Lake is located in the northern section of the JPG facility above "K" Road and provides camp sites, boat ramps, and boat rentals. Fishing and hunting are major recreational activities at the JPG facility. Hunting is allowed on the installation by employees, family members, guests, and retired employees. During the 1992 hunting season, approximately 600 deer and 50 turkey were taken on the installation. Squirrels, rabbits, and small gamebirds are also harvested. Access to recreational facilities on the JPG is limited and strictly controlled (USACOE 1991 y).

4.3.2 Socioeconomic Region of Influence

The socioeconomic ROI of this EIS comprises Jefferson, Jennings, and Ripley Counties. The three county ROI was selected for the determination of socioeconomic impacts since the JPG facility is located in these three counties and, historically, the majority of JPG's work force has resided within these three counties. Relevant ROI factors for analysis include income, employment, economic activity, population, housing, school, and recreational resources.

4.3.3 Region of Influence Description

The per capita income in each of the counties making up the ROI has steadily risen since 1989, and has actually approached the national average per capita income. These figures

are presented in Table 4-2 (Bureau of Economic Analysis, May 5, 1994). This reflects a strong regional economy with healthy growth.

Table 4-2. Per Capita Income and National Average Comparison.

County	1989		1990		1991		1992	
	Percent of		Percent of		Percent of		Percent of	
	Per Capita Income	National Average	Per Capita Income	National Average	Per Capita Income	National Average	Per Capita Income	National Average
Jefferson	12,697	72	13,352	72	13,858	72	14,936	74
Jennings s	12 65	72	13 216	71	13 465	70	14 766	73

Economic performance in the ROI improved significantly in the period between 1985-1990. Total employment in the ROI increased by 4.4 percent in the period between 1985 and 1990, while the unemployment rate declined from 9.9 percent to 5.9 percent in the same period. Table 4-3 depicts the labor force profiles in the ROI.

Table 4-3. Labor Force Profile 1985 and 1990.

County	Employment				Unemployment			
	1985	Rate	1990	Rate	1985	Rate	1990	Rate
Jefferson	13,625	88.4%	13,550	94.4%	1,575	11.6%	800	5.6%
Jennings	9,700	90.6%	11,780	94.5% ^a	1,000	9.4%	690	5.5%
Ripley	10,725	91.3%	12 650	94.2%	1,025	8.7%	770	5.7%
ROI	34,050	90.0%	37,980	94.4% ¹¹	3 600	9.9%	2,260	5.6%

Sources: Indiana University, Bloomington; Industrial Research Liaison Program, *Indiana Infonet*, 1992.

Economic activities in the ROI are based mainly on manufacturing, government, retail trade, and services. A breakdown of regional economic activity by sector is provided in Table 4.4. The manufacturing sector provided 33.5 percent of the jobs for the ROI in 1989. The greatest number of jobs were from the manufacturing sector. The government sector provided 6,199 jobs, or 20 percent of the jobs in the ROI in 1989 with the highest increase in government jobs created in Ripley County. The wholesale trade sector experienced the most rapid growth in the ROI in the period 1985-1989. Employment in wholesale trade increased by 124.2 percent in Jennings County and 87.4 percent in Ripley County. However, employment in wholesale trade declined in Jefferson County by 20.5 percent in the period between 1985-1989.

Table 4-4 Regional Economic Activity							
Economic Activity	Employment						
	Jefferson County		Jennings County		Ripley County		Regional Total
	1989	Change 1985 -1989	1989	Change 1985 -1989	1989	Change 1985 -1989	
Agricultural Services	51	41	51	45.7	186	45.3	288
Mining	NA	NA	NA	NA	27	68.8	28
Construction	499	25.7	NA	NA	590	45.0	1089
Manufacturing	3,956	34.0	1,795	31.2	4,563	23.1	10,314
Transportation	NA	NA	339	11.1	697	6.7	1,036
Wholesale Trade	209	(20.5)	148	124.2	448	87.4	805
Retail Trade	2 571	24.0	1 198	21.5	2 123	36.2	5 892
Finance, Real Estate, Insurance	610	6.8	451	34.2	466	5.0	1,527
Services	NA	NA	1 236	9.0	2 577	20.9	3 813
Government	2,714	3.9	2,267	10.2	1,218	15.3	6,199

Note: Decreases are shown in Q.

Source: Indiana University, Bloomington, Indiana; Industrial Research Liaison Program, Indiana infonet, 1992; National Bureau of Economics, 1992.

Jennings County experienced the most rapid growth in employment in the agricultural services sector which grew by 41 percent in the period between 1985-1989. During the same period the manufacturing and construction sectors reported an increase in employment of 34 percent and 25.7 percent, respectively.

Improved performance in the economy also is reflected in the business volume which rose from \$489,222 in 1985 to \$712,288 in 1990, representing a 68 percent increase in the fiveyear period. Personal income for the same period increased from \$775,603 to over \$1 million (Bureau of Labor Statistics, 1991). Per capita income for the region averaged approximately \$13,288 in 1989 with Ripley County reporting the highest income (\$14,462) and Jefferson County the lowest (\$12,022) in the three county region.

Population in the ROI increased from 77,681 people in 1980 to 78,074 people in 1990, a 1.0 percent change. During this period, Jennings County experienced the highest population growth rate (3.5 percent), and Jefferson County reported a 2.0 percent decline. During the same period, the ROI experienced a net emigration of 3,100 people with the highest outflow from Jefferson County. Table 4-5 depicts the ROI population for 1980 and 1990 and projections for the year 2000.

Table 4-5. Population.			
County	1980	1990	2000 (Projected)
Jefferson	30,419	29,797	29,580
Jennings	22,864	23,661	23,570
Ripley	24,398	24,616	26,730
ROI	77,681	78,074	79,880

Source:

Bureau of Economic Analysis, 1980; U.S. Department of Commerce, 1990 Census of Population and Housing; Indiana Regulations Planning Committee.

The ROI had 30,637 housing units in 1990, both owner-occupied and rental units. A total of 28,026 housing units were occupied, with an average vacancy rate of approximately 8.5 percent. As shown in Table 4-6, Jefferson county had the most housing units (11,921). Vacancy rate of owner-occupied and rental units was consistent throughout the ROI, averaging 8.5%. In 1990 the median value of an owner-occupied home was \$45,866 and the median contract rent was \$217. Median values of owner-occupied homes were highest in Ripley County (\$49,000) and lowest in Jennings County (\$43,700). There was no significant difference in the median contract rent in the three counties.

Table 4-6. Housing in the ROI, 1990.					
County	Housing Units	Occupied Housing Units	Vacancy Rate	Median Value	Median Contract Rent
Jefferson	11,921	10,897	8.6%	\$44,900	\$215
Jennings	9,129	8,351	8.5% ^a	\$43,700	\$221
Ripley	9,587	8,778	8.4%	\$49,000	\$215
Total	30,637	28,026	8.5%	\$45,866	\$217

Thirty schools are located within the JPG ROI. These include 19 elementary schools, 3 junior high schools, and 8 senior high schools. Total student enrollment in the ROI for the 1993-94 school year was 14,170.

Jefferson County has two public school districts, the Madison Consolidated School Corporation and the Southwestern Jefferson County School Corporation, and one parochial high school and elementary school. Jennings County has one school system, the Jennings County School Corporation. Ripley County has four school districts, South Ripley Community School Corporation, Jac-Cen-Del Community School Corporation, Batesville Community School Corporation, and Milan Community School Corporation. Table 4-7 provides information on distribution of the schools among the ROI counties and student enrollment.

Table 4-7. Schools.

County	School Districts	Elementary Schools	Junior High Schools	Senior High Schools	1993-1994 Enrollment
Jefferson	2	10	1	3	4,828
Jennings	1	5	1	1	4,374
Rile	4	4	1	4	4,968
ROI	7	19	3	8	14,170

Institutions of higher learning located in the tri-county region include Hanover College in Hanover; Purdue University-Southeastern in Versailles; and Indiana Vocational Technical College located in Madison.

There are several recreational facilities available within ROI. Clifty Falls State Park encompasses over 1,300 acres in Jefferson County. The park offers a variety of services and activities including a motel, camping, hiking, swimming and tennis courts. In Madison, city-owned recreational facilities, totalling over 220 acres, include an 18-hole golf course, eight tennis courts, two swimming pools, picnic facilities, and the Madison Sports complex (PSI Energy 1991). The Jennings County Muscatatuck Park extends to 230 acres and provides camping areas, picnic facilities, baseball fields, soccer fields, and volleyball courts. Other parks in Jennings County include the Crosley State Fish and Wildlife area, Brush Creek State Fish and Wildlife Park, the Muscatatuck National Wildlife Refuge, and the Selmier State Forest. In Ripley County, the Versailles State Park, the second largest park in Indiana, provides camping, hiking, horseback riding, swimming, fishing and boating on a 230-acre lake. The park is located approximately two miles from the City of Versailles (Indiana Division of State Parks 1992).

4.4 PUBLIC HEALTH AND SAFETY

4.4.1 Law Enforcement

The JPG maintains a security force of twenty-two persons, guarding the installation twenty-four hours a day, seven days a week on a rotation cycle. The security function is provided for under the Directorate of Law Enforcement and Security. All security and law enforcement functions are provided on-site. While off-site law enforcement or security personnel are not utilized by the installation, the JPG facility does have a mutual aid agreement with the City of Madison, the surrounding municipalities, and the Indiana State Police (Hoskins, October 1993).

Local law enforcement for the City of Madison is provided by a 29 member police force, headed by the Chief of Police. Law enforcement for Jefferson County is provided by the County Sheriff and nine police officers (PSI Energy 1991). The City of North Vernon, approximately 35 miles from the JPG facility, has a police force consisting of 18 officers. Law enforcement for the County of Jennings is provided by the County Sheriff and nine officers (Jennings County Economic Development 1992). Ripley County has one Sheriff and five deputy law enforcement officers. The City of Versailles Police Department, in Ripley County, has one full time and three reserve law enforcement officers (Versailles Chamber of Commerce 1992).

Jefferson, Jennings, and Ripley County State Conservation Officers, designated as Deputy Federal Game Wardens, have authority to enforce wildlife statutes on the JPG.

4.4.2 Fire Protection

Fire protection services in support of the mission are administered within the Fire Protection Division of The Directorate of Engineering, Housing, and Logistics. The Fire Protection Division has a fire station in Building B-125 staffed by thirteen full time personnel. In addition, the JPG maintains a 500,000 gallon water tank to provide water in the event of on-site fire emergencies. A system of 89 fire hydrants throughout the cantonment area provide water for site-specific fire fighting (Wolfschlag, October 1993).

Volunteer organizations provide fire protection throughout the tri-county region. A staff of 210 volunteer firefighters supports the City of Madison and Jefferson County (PSI Energy 1991). One hundred eighty volunteers serve North Vernon and Jennings County, and 20 volunteer firefighters serve the City of Versailles and southern Ripley County (Versailles Chamber of Commerce, April 1992). The Fire Protection Division at the JPG interacts with these local fire protection services through several mutual aid agreements.

The JPG fire department ceased operations on June 30, 1995. Equipment and personnel have been relocated to other government installations. On July 1, 1995, the government entered into an agreement with two local fire departments for the provision of fire protection services for the JPG until the time of final disposal of the installation.

4.4.3 Medical Services

Limited medical services are provided by the JPG to installation personnel and their dependents, retired military personnel, and DoD authorized personnel. Medical care at the small on-post clinic is provided by the Occupational Health Nursing Office which operates as a tenant under the command of the U.S. Army Health Services Command Medical Department. Limited out-patient or emergency medical care is available through the Occupational Health Nursing Office. The clinic has only minor medical care and diagnostic capabilities and is supported by a staff of one nurse and one administrative employee. Patients requiring further medical assistance are referred to civilian facilities in the City of Madison. The Occupational Health Nursing Office provides ambulance services during testing operations and installation emergencies.

The City of Madison medical support services include the King's Daughter's Hospital, with a 144 bed capacity, and the Madison State Hospital, with a full staff of general practitioners, psychiatrists, and consultants. Other medical facilities serving the City of Madison and Jefferson County include two medical clinics, four nursing homes, and a 24-hour ambulance service (PSI Energy 1991).

Medical services for Jennings County are provided by Jennings Community Hospital in North Vernon. This hospital has a 48-bed capacity and maintains a 24-hour, physician-staffed emergency room. Other medical facilities for the county include two nursing homes, several private medical clinics, and services provided by the Visiting Nurses Association (Jennings County Economic Development 1992).

The Margaret Mary Community Hospital, with a 94-bed capacity, is located in Batesville, approximately 45 miles from the JPG. The hospital provides medical services for Ripley County and has a 24-hour emergency facility. The King's Daughter's Clinic, a branch of the City of Madison's King's Daughter's Hospital, is located in the City of Versailles, approximately 20 miles from the JPG (Versailles Chamber of Commerce, 1992).

4.5 UTILITIES AND SOLID WASTE

4.5.1 Potable Water

The JPG obtains its water from the City of Madison via supply wells located along the Ohio River. While the service area demand averages 2.85 million gallons per day, the Madison Water Authority is capable of providing up to 8.0 million gallons per day. The bulk of the JPG's water demand comes from the domestic needs of installation residents and the industrial needs of the steam heat generation plant (USACOE 1991).

Water is supplied to the facility through an eight-inch polyvinyl chloride pipe from a 500,000 gallon water tank located on the JPG facility. The Cannan Water Company furnishes potable water to both Gate 1 and the Old Timbers Lodge. A waterline entering through Gate 9 follows K Road. The installation's distribution system consists of over 20.5 miles of water lines. The system lacks cathodic protection, and its primary maintenance problems result from its 50-plus years of use (USACOE 1991).

4.5.2 Wastewater Treatment

The JPG maintains and operates its own wastewater collection system and wastewater treatment plant. The wastewater collection system, brought on-line in 1941, is predominantly maintained by gravity flow. Low-lying areas are serviced by four lift stations. The system has a total throughput capacity of 270,000 gallons per day with an average flow from 1991 to 1993 of 41,000 gallons per day (McKittrick, April 1993).

Domestic sewage accounts for more than 97% of wastewater generated by the JPG. Industrial wastewater accounts for a minimal amount of total wastewater production. The two principal sources contributing to the industrial wastewater flow are photographic wastes (averaging 170 gallons per day) and boiler blowdown (800 to 1,000 gallons per day during winter months). These amounts have remained essentially constant for the past several years (McKittrick, April 1993), though the photographic wastestream ended September 30, 1994, with cessation of operations. Due to the age of the collection system there have been excessive infiltration and inflow problems during heavy rainfall and wet weather periods. Approximately 28,000 linear feet of leaking vitrified clay pipes and lines were replaced in 1988-89.

The JPG holds a National Pollutant Discharge Elimination System (NPDES) permit for its wastewater treatment plant which is effective through June 30, 1995. The plant is in compliance with the permit's total suspended solid levels of 15 mg/l weekly average and 10 mg/l monthly average (McKittrick, April 1993). Requirements include monitoring for ammonia-nitrogen, dissolved oxygen, and residual chlorine. However, residual chlorine monitoring was discontinued in mid-1993 because the chlorine disinfection system has been replaced with an ultraviolet disinfection system (McKittrick, October 1993).

Sanitary sewer service is unavailable north of the firing line. Septic tanks are utilized at Buildings 510, 708, 485 (Old Timbers Lodge), 194, and 269 (USACOE 1991).

4.5.3 Storm Drainage

Storm water from the JPG is collected within the cantonment area through a deteriorated system of 120,704 linear feet of vitrified clay pipe. Numerous outfalls empty into the Middle Fork and Harberts Creek drainage system. The largest outfall measures 42 inches. Actual discharge quantities are unknown. The storm water system north of the firing line consists primarily of culverts and drainage ditches (Fritsche, October, 1993). On July 1, 1993, the Indiana Department of Environmental Management issued National Pollutant Discharge

Elimination system permit No. INR 00J002 to the JPG. On June 15, 1994, the facility requested an extension for implementation of the Stormwater Pollution Prevention Plan until January 1995, at which time responsibility for execution of actions related to stormwater pollution prevention will become part of the caretaker contractor's statement of work.

4.5.4 Heating and Fuel Systems

Heat is supplied to JPG facilities through a No. 2 fuel oil-fired central heating system. The existing system consists of two high-pressure steam generating stations, each having its own network of steam and condensate return lines. The central heating plant serves most of the occupied on-post buildings, and the Building 600 plant serves the complex where ammunition assembly occurs. Both operational plants are well maintained and in good operating condition. The plant serving the Building 600 complex was closed in 1994 after cessation of the testing mission. Two additional nonoperating steam generating plants at the JPG are in mothball status. Twelve of the 13 family housing units are equipped with individual No. 2 fuel oil-fired boilers (McKittrick, April 1993), and one set of family housing quarters has an oil-fired forced air furnace (Cloud, November 94). During Fiscal year 1994, base-wide heating oil consumption was 279,420 gallons (Cloud, November 1994). The JPG is not supplied with natural gas, and there is no coal consumption.

4.5.5. Electrical Systems

Public Service Indiana provides electricity to the JPG substation through five separate overhead transmission points from its North Madison substation. The largest feed circuit has a potential of 34.5 kilovolts. Two of the main feeder lines have three transformers each. One of these two lines has three 667-kilovolt amp transformers and the other has three 333kilovolt amp transformers. Electricity is distributed from the substation through five radial feeds and a system of pad and pole mounted transformers to the firing line and cantonment area of the installation (McKittrick, April 1993). The on-post distribution system consists of 5,124 kilowatts of transformer capacity and 265,142 linear feet of overhead line and 65,725 linear feet of underground line. Public Service Indiana provides electricity to facilities in the northern portion of the installation along K Road via a 12-mile long feed from the North Madison Substation.

The JPG's electrical distribution system suffers from breakdowns, current fault areas, circuit overload, and increasing maintenance costs. It is in need of modernization to rectify its inadequacies and obsolescence. The JPG was in the process of gradually upgrading the system when it was notified of the base closure (USACOE 1991). A substation for the 12.4 kilovolt standby electrical system has been upgraded with new switching gear (McKittrick, October 1993). PSI has considerable reserve capacity and does not anticipate any near-term shortages (USACOE 1991).

4.5.6 Solid Waste

The JPG closed its Gate 19 landfill in October 1993. The 12 acre site, located adjacent to the West Perimeter Road near the firing line, received nonhazardous wastes, construction debris, and asbestos (McKittrick, August 1993). Analyses of samples from monitoring wells around the landfill in June 1992 showed elevated levels of mercury. A subsequent U.S. Army Environmental Hygiene Agency confirmation study established that the analyses were inaccurate. The operation of the solid fill site complied with applicable Federal and Indiana disposal regulations (Herring, April 1993). The State of Indiana has approved the JPG's closure plan for the landfill. As part of the closure, a contract to cap the landfill has been awarded and work is scheduled to begin in the spring 1995 and be completed by summer 1995.

There are six other closed landfills and one open dump for construction debris only on the JPG. All of the landfills except one at Engineers Road are north of the firing line. These landfills were used for the disposal of solid wastes and construction debris. Base officials believe there is a remote possibility that stray rounds could have landed in the landfills north of the firing line. Based on an ordnance explosive waste archives search, there is no reason to believe there is any unexploded ordnance in landfills south of the firing line.

The JPG maintains a contract with a private contractor for general pick-up, transport, and disposal of sanitary refuse. Annual quantities of municipal solid waste collected from the installation were 8,862 cubic yards and 9,720 cubic yards for fiscal years 1991 and 1992, respectively. Waste is transported to a transfer station managed by the City of Madison for off-site disposal in a landfill (Ehlert, April 1993). Ammunition crates contaminated with pentachlorophenol are collected in a 30 cubic yard bin, which is then hauled from the base to a certified landfill in Uniontown, Indiana.

Franklin, Jefferson, Jennings, Ohio, Ripley, Scott, and Switzerland Counties make up the Southeastern Indiana Solid Waste District. Landfill capacity in the ROI relies on two principal sites. The solid waste landfill in Ripley County has submitted a court appeal to a denial of a rezoning request to allow continuation of use through 1995. This landfill accepts 400 tons of waste per day (75 trucks). The Jennings County solid waste landfill, with a five year life expectancy, is seeking approval for an 18 acre expansion. This landfill accepts 200 to 250 tons of waste per day.

There are two incinerators in the cantonment area at the JPG. The older incinerator, located in Building 185, was used from the time the installation opened until 1978. The unit burned small ammunition, debris, and waste paper products. It is believed that the ash from the unit was placed in the landfill at Engineers Road. The newer unit is a multichambered incinerator. Located in Building 333, it is used primarily for the burning of waste paper products. This incinerator, unlike the older unit in Building 185, is equipped with an afterburner to reduce air emissions. Permitting for the incinerator is discussed in detail in Section 4.10.

The JPG operates a recycling program for computer paper, white office paper, aluminum cans, and used oil. These materials are collected by private contractors. Annual recycling quantities are estimated to be 800 to 1,000 cubic yards of solid wastes and less than 1,000 gallons of oil (Ehlert, April 1993).

4.6 VISUAL RESOURCES

The JPG can be divided visually into the areas north and south of the firing line. The area south of the firing line, or cantonment area, is a well maintained area with buildings to support the installation staff. The Main Gate entrance to this area is flanked by manicured grounds and tree lined open spaces that provide a visually attractive entrance to the facility. The road leading to the administrative area is lined with maple trees 40-50 feet tall; in recent years, these have been subject to blowdown, disease, and insect damage. The buildings in the administrative area are predominantly wood structures and are surrounded by well maintained grounds and parking lots. The operations and maintenance buildings are predominantly red brick and are heated by steam through an above ground piping system located along Woodfield Road. Grass in large open areas on the facility is maintained at a height of approximately two feet. The thirteen housing units are arranged along a tree lined elongated horseshoe-shaped drive. Other visual resources south of the firing line include Krueger Lake, approximately 1,200 feet long and 250 feet wide. A closed airfield occupies the southwestern area of the base. The airfield has four runways, of which two are 5,000 feet in length and two are 4,500 feet in length. The remainder of this area consists of woodlands and grassy areas. One of the dominant visual features in this area is a 500,000 gallon water tower.

Areas north of the firing line consist primarily of heavily vegetated rolling hills, with some open spaces. The JPG manages over 22,000 acres of hardwood timber. Ranges impact areas are interspersed throughout the portion north of the firing line. In the northeast corner of the base is a 165-acre lake used for small nonmotorized boats and fishing. Streams and associated deep gullies are interspersed throughout the site. Large flood gates were installed for security purposes at stream exit locations along the base's western fenceline. Interceptor piers, which catch debris, are located upstream of the flood gates. More than 48 miles of chain link fence topped with barbed wire surrounds the JPG facility. The view of the facility from the fenceline is primarily obscured by trees approximately 30 to 50 feet tall with a thin undergrowth. Occasional open spaces around the fenceline permit views of up to several hundred yards.

4.7 CULTURAL RESOURCES

Base realignment and closure actions that may have an effect on significant historic places, including buildings, structures, sites, districts, and objects that meet the criteria of the National Register of Historic Places, must be evaluated in light of the NHPA and regulations issued by the Advisory Council on Historic Preservation. The JPG has executed a MOA with the Advisory Council on Historic Preservation and the Indiana SHPO. This MOA, discussed below, commits the Army to specific measures for identification, evaluation, treatment, and management of historic properties.

4.7.1 Archaeological Resources

Two modestly-scoped Phase I surveys for prehistoric archaeological sites at JPG have been conducted, resulting in discovery of limited evidence of prehistoric occupation. A Phase I survey is designed to examine all or part of an area in sufficient detail to draw general conclusions regarding the type and distribution of archaeological or historic properties that may be present; a Phase II survey includes a systematic, detailed examination of an area which is sufficient to determine if a site is significant and therefore eligible for nomination to the National Register of Historic Places.

In 1975, the Glenn A. Black Laboratory conducted a Phase I survey of 150 acres in the north central part of the JPG, immediately north of Graham Creek. The survey unearthed a single fragmentary projectile point diagnostic of the Late Woodland/Mississippian time period (1000 to 1650 A.D.).

In late 1992, the Archaeology Service Center at Murray State University performed a Phase I Survey of three parcels encompassing 78 acres in Timber Area I and five parcels encompassing 138 acres in Timber Area II. The survey resulted in recording of 10 sites (12Jn257 through 12Jn266) in Timber Area I in the extreme northwest part of the JPG, predominantly in the vicinity of Otter Creek. Five more sites were recorded (12Ri153 through 12Ri157) in Timber Area II in the extreme north central part of the JPG, predominantly along Falling Timber Branch.

Four of the sites were prehistoric isolated finds. One site was an isolated find of a Terminal Archaic projectile point (4000 to 1000 B.C.). The other three sites were of indeterminate cultural affiliation.

Nine of the sites were small lithic scatters of indeterminate prehistoric cultural-temporal affiliation. The sites probably represent processing stations or short-term habitation sites. Only a limited number and diversity of artifacts was found at each site.

One site was an early to mid-twentieth century residential site. It revealed only a low number of artifacts.

One site was multi-component, with an indeterminate prehistoric occupation and a late nineteenth to early twentieth century farmstead present. The prehistoric component consisted of a lithic scatter from which no diagnostic artifacts were recovered. Previous timbering and military operations and construction of the historic farmstead appear to have destroyed the integrity of the prehistoric site component.

All of the sites recorded in this survey were considered to be ineligible for the National Register of Historic Places. No additional archaeological work was recommended for any of the 15 sites.

The topography of the JPG, along with the presence of large numbers of local archaeological sites on similar topographic settings, indicates a high probability that many other prehistoric archaeological sites could be located within unsurveyed areas of the JPG's boundaries (USACOE, 1991). That topography similar to the JPG's is conducive to prehistoric activity is illustrated in the findings of other cultural resources surveys undertaken in the vicinity of the JPG. Major archaeological research projects in south-central Indiana have located large numbers of prehistoric sites. An archaeological resources survey in conjunction with installation of the Texas Gas Pipeline resulted in locating over 200 sites, mostly of the Archaic Period (8000 to 1000 B.C.), in a 100 mile corridor. Most of these sites were situated in areas similar to the JPG topography, i.e., near or overlooking a water source or on an area of good drainage.

No organized archaeological surveys or projects have been conducted to search for historical cultural remains at the JPG. There has been, however, a compilation of possible historic sites, prepared by Stafford et al in 1985, based on research of historical atlases, plat books, and other maps published between 1876 and 1921. Most of these sites are within areas north of the firing line; no organized surveys have been conducted to confirm or deny the current condition or existence of these sites.

Despite limited access for more than 50 years to the majority of areas of the base and virtually no development north of the firing line, there has been some loss of potential historic sites. Construction of the JPG in the 1940s leveled some potential historic sites. Numerous impact areas north of the firing line have probably resulted in limited damage to or destruction of some potential historic sites. Creation of Old Timbers Lake in the northeast portion of the base and resultant inundation of part of Little Otter Creek may have affected potential historic sites in the past. These circumstances notwithstanding, the size of the installation renders probable there being substantial areas of undetermined status throughout the JPG.

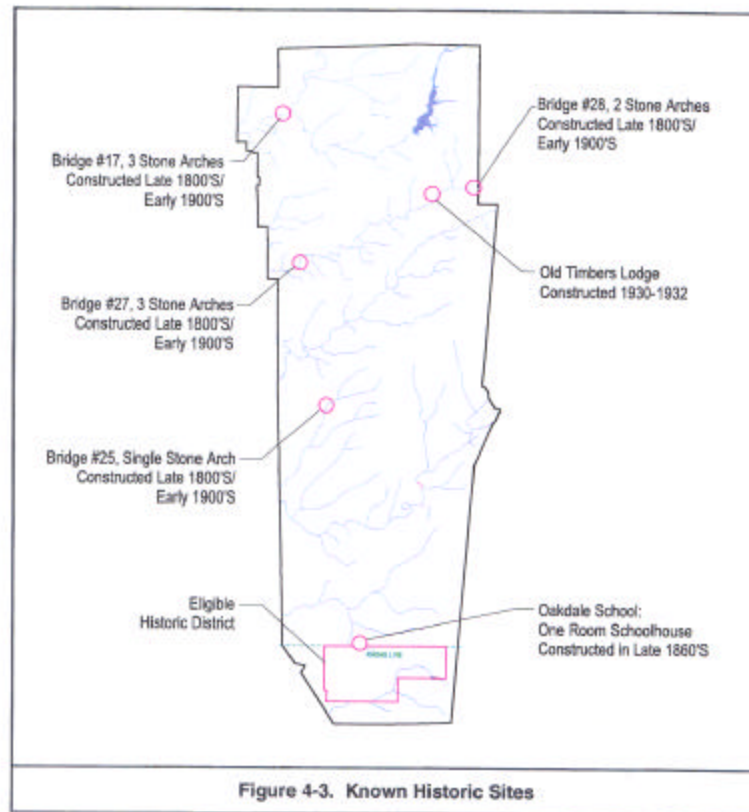
Three stone markers, generally along MD Road, identify the route taken in 1863 when Confederate General John H. Morgan and 2,500 cavalymen conducted a raid through southern Indiana.

4.7.2 Historic Architectural Resources

Locations of the JPG's known historic architectural resources are shown in Figure 4-3. The significance of these sites is discussed below:

The Oakdale School, built in the 1860s and one of the few remaining one-room schoolhouses in the local area, is located just north of the firing line. Constructed of limestone masonry, it is a good example of an intact architectural type. The Oakdale School was placed on the National Register of Historic Places in May 1993.

Four stone arch bridges are known to exist within the JPG boundaries: Bridges Number 17, 25, 27, and 28. Locations of these structures are shown in Figure 4-3.



Bridge Number 17, constructed in 1910-1912, is listed as a Historic Inventory site by the Historic Landmark Foundation of Indiana. The other three bridges, of similar construction, exist as excellent examples of local masonry bridge design and construction. In March 1989, the Indiana SHPO determined that all four bridges were eligible for inclusion in the National Register of Historic Places. Nomination forms on all four bridges have been completed and sent to the Indiana SHPO for certification.

- The Old Timbers Lodge, built as a country house by Cincinnati industrialist Alexander Thompson in the early 1930s, represents the arts and crafts tradition of the early twentieth century and features a "great hall" flanked by massive stone fireplaces. Located in Otter Creek Township of Ripley County (see Figure 4-3), the facility is presently used as a recreational lodge for JPG staff. Evaluation of the structure found it to be Category III, designating its minor significance. Concurring in that assessment, the Indiana SHPO determined in January 1986 that the Old Timbers Lodge was not eligible for inclusion in the National Register of Historic

Places. However, based on a site visit in May 1992, by letter of June 23, 1992, the Indiana SHPO agreed that Old Timbers Lodge is eligible for the National Register.

The majority of the cantonment area is eligible for inclusion in the National Register of Historic Places as one large historic district. By letter dated May 12, 1994, the Indiana SHPO informed the JPG that the historic district would encompass, at a minimum, all of the World War II era permanent and semi-permanent buildings and structures and the pre-war houses that were relocated to Officers Quarters Road during the war. This district is significant for its role in U.S. military history and also for its role in the social and economic history of southeastern Indiana. The Indiana SHPO has recommended that a historic preservation consultant be retained to investigate further the significance of the district and to define more precisely which buildings and structures contribute to the district's significance. Additional research could also lead to a finding that the Korean War era buildings contribute to the significance of the district as well.

Other potential historic architectural resources exist. For example, some of the metal and wooden truss bridges at the JPG may be significant because of their being good examples of an intact historic engineering type. In March 1989, the Indiana SHPO indicated the usefulness of inventorying the spans standing within the JPG.

4.7.3 Consultation and Preservation Activities

On July 17, 1992, the Army entered into a Memorandum of Agreement with the Indiana SHPO and the Advisory Council on Historic Preservation. A copy of the MOA appears at Appendix D. The MOA commits the Army to measures designed to achieve goals consistent with the National Historic Preservation Act:

The Army is to prepare, in consultation with the Advisory Council on Historic Preservation and the Indiana SHPO, a Cultural Resource Management Plan. The Plan will address the full range of historic properties that may exist at the JPG, including but not limited to buildings and structures, archaeological sites, and traditional cultural properties. The purpose of the Plan will be to establish processes for integrating the preservation and use of historic properties with Army mission and programs. This Plan is to contain a database of surveys and property descriptions in terms of National Register of Historic Places criteria, as well as procedures for management of historic properties, including their use, preservation, maintenance, mitigation measures, and consultation. Finally, the Plan is to address compliance requirements related to the Native American Graves Protection and Repatriation Act.

The Army is committed to providing interim protection of historic properties. Specified sites include the Old Timbers Lodge, the Oakdale School, and four Stone Bridges (Numbers 17, 25, 27, and 28). Timber management actions will include inventory and assessment of archaeological sites. Soil-disturbing activities or projects involving construction disturbance of previously undisturbed surfaces, or tillage of previously unplowed ground remain subject to coordination requirements with the Indiana SHPO and the Advisory Council on Historic Preservation.

Upon disposal of JPG to any other federal agency for conservation purposes, historic preservation obligations shall be deemed to pass to that other agency. If JPG is disposed to another federal agency for purposes other than conservation, then the Army shall determine what, if any, additional measures are needed to achieve compliance with historic preservation regulations at Title 36 *Code of Federal Regulations* Section 800.

Upon disposal to any non-federal entity of archaeological properties eligible for entry in the National Register of Historic Places, the Army must include in the conveyance document a restrictive clause prohibiting ground disturbing activities without the prior written consent of the Indiana SHPO.

Upon disposal to any non-federal entity of historic structures eligible for entry in the National Register of Historic Places, the Army must include in the conveyance document a restrictive clause prohibiting construction, alteration, remodeling, or action affecting the integrity or appearance of the property without the prior written consent of the Indiana SHPO.

The Army shall ensure that personnel conducting remedial investigation and feasibility study tasks related to the Installation Restoration Program are familiar with historic property compliance requirements. This shall include consulting with a professional archaeologist prior to field work and having access to such expertise in the event of discovery of archaeological resources.

4.8

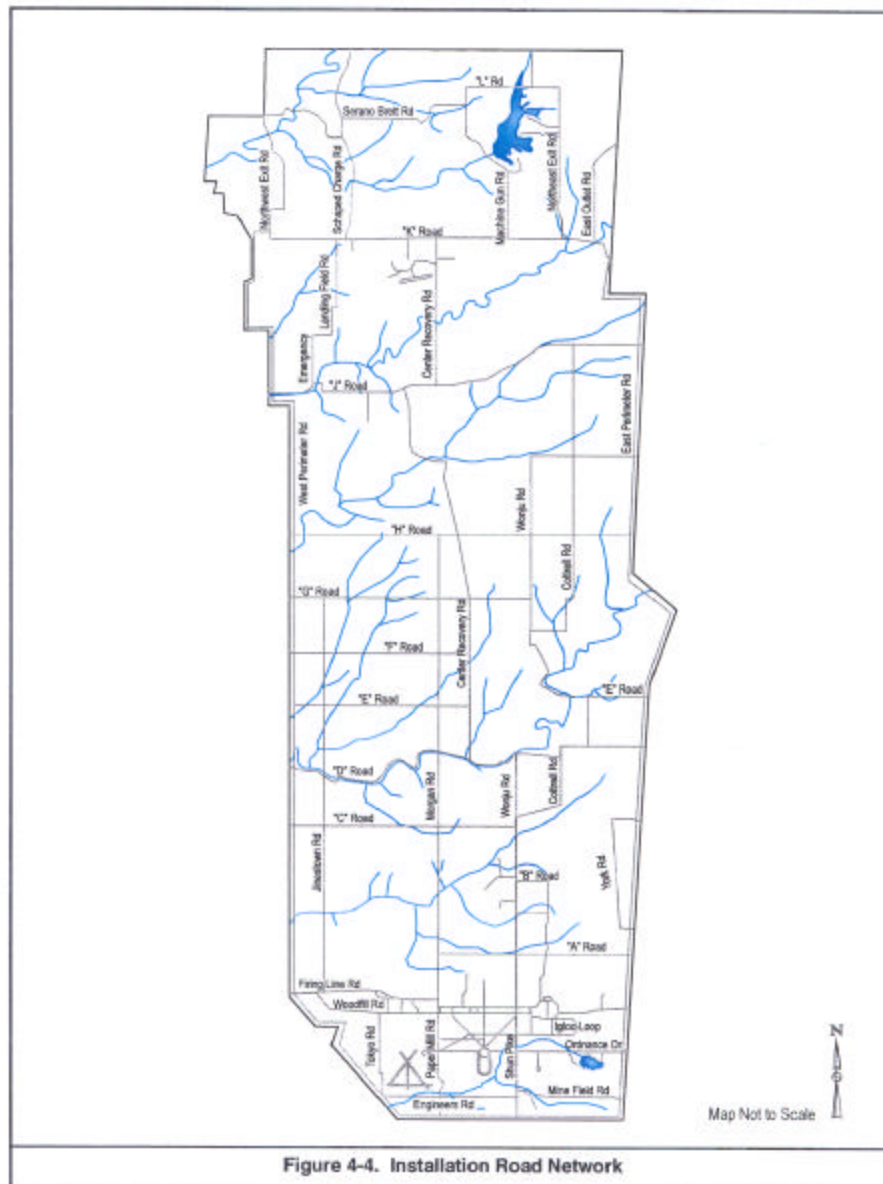
TRAFFIC AND TRANSPORTATION

JPG's installation road net consists of 196 miles of improved roads, 22 bridges, and 10 low water crossings (see Figure 4-4). Improved roadways of concrete or asphalt surface total 34 miles, and gravel surfaced roads constitute the remainder of the road network. There are also some unimproved roads on the installation. Most of the roads are in good condition. All of the roads in the cantonment area are paved. Sections at low water crossings of the West Perimeter Road, East Perimeter Road, and a section of "K" Road east of Machine Gun Road are the only paved roads in the test range area. The majority of the bridges are in good condition and require only routine maintenance (USACOE 1991).

Three interstate highways are near the JPG. Interstate 65, running north-south, is 30 miles to the west. Interstate 74, running east-west, is 40 miles north of the JPG. Interstate 71, running north-south, is 30 miles southeast of the JPG. Access to the installation is via U.S. Route 421, a two lane road following the southeastern border of the base. Due to its rural location and relative isolation, the JPG does not have any significant traffic congestion or access problems. Indiana Department of Transportation annual average daily traffic figures reveal a daily rate of 3,750 vehicles on U.S. Route 421 at the JPG's Main Gate (USACOE 1991).

The JPG's rail service is owned and operated by the City of Madison Port Authority, a 24-mile sole source spur from Madison to North Vernon in Jennings County. Until cessation of the firing mission in September 1994, railways provided a transportation mode for ammunition and test components for the JPG. Through gradual deterioration of the installation's 16 miles of standard gauge track, 10 miles were condemned (USACOE 1991). In 1993, the JPG upgraded 2.6 miles of the rail to Class 1, Active Standard for rail service of materials and heavy equipment (Eaglin, September 1993).

The JPG airfield was constructed in 1941 to handle bombers and large cargo aircraft. It consists of four concrete runways, two approximately 5,000 feet long and two measuring 4,500 feet in length. There are 507,000 square feet of taxiways and 349,000 square feet of apron area. The hangar (Building 301) has 24,084 square feet of floor space. During the early 1960s the airfield was closed to fixed wing aircraft. Due to deteriorating runway conditions and outdated equipment for airspace control the airport has remained closed to all air traffic. Runways currently show signs of concrete spalling, and reinforcing steel bars in the runway are visible in a few places. In the past, helicopters have used the closed facility, but that use has been infrequent in recent years.



4.9 NOISE

As required by Army regulation, the JPG has conducted operations in light of an Installation Compatible Use Zone program. The program is based on a 1983 environmental noise assessment, prepared by the U.S. Army Environmental Health Agency, to quantify major noise sources.

Noise can be defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level of energy content (amplitude). The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. The decibel (dB) scale is used to quantify sound intensity. Because sound pressure can vary by over one trillion times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. Since the human ear is not equally sensitive to all frequencies within the entire spectrum, noise measurements are weighted more heavily within those frequencies of maximum human sensitivity in a process call "A-weighting" (expressed as dBA). Additionally, sudden, short duration infrasonic and lower frequency noise such as cannon fire is measured on a "C-weighted" scale (dBC) and is considered more disturbing than A-weighted noise.

Time variation in noise exposure is typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called Leq), or, alternatively, as a statistical description of the sound level that is exceeded over some fraction of a given observation period. A day/night noise level, which penalizes noise created between 10:00 pm and 7:00 am, adds 10 dBA to measured noise values when a 24 hour logarithmic average is calculated.

Under the Installation Compatible Use Zone program, three noise zones are defined for the A-weighted day-night level for continuous noise such as aircraft or traffic noise and C-weighted day-night level for impulsive noise from weapons other than small arms. These noise zones help identify compatible land uses in the vicinity of noise generators. Table 4-8 shows these zones. Zone III is that one closest to the noise source, and Zone I is farthest from the noise source.

Table 4-8. Noise Zone Values.

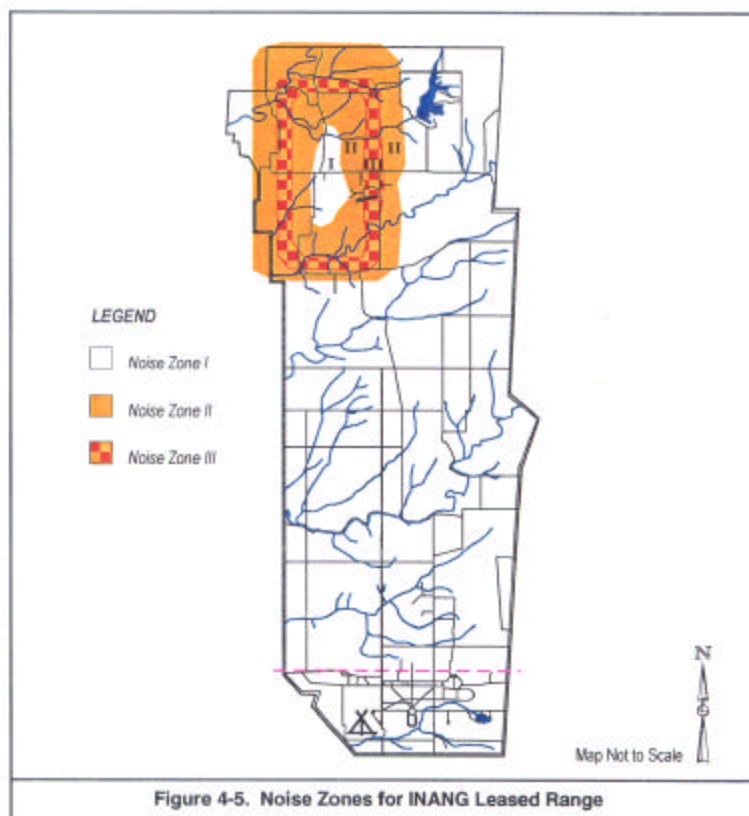
Zone	A-Weighted Day-Night Level	C-Weighted Day-Night Level	Noise Sensitive Land Use (housing, schools, hospitals)
I	less than 65 dBA	less than 62 dBC	acceptable
II	65-75 dBA	62-70 dBC	normally unacceptable
III	more than 75 dBA	more than 70 dBC	unacceptable

Major noise sources contributing to the Installation Compatible Use Zone program at the JPG include impulse sounds of 90 to 140 decibels caused by the testing of large weapons and blast detonations, 100 to 115 decibels caused by tracked vehicles, and 90 to 120 decibels caused by Indiana Air National Guard use of the air-to-ground gunnery range.

Noise zones for the Installation Compatible Use Zone program for tank, artillery, mortar, and gun events were generated on the BNOISE computer program developed by the Army

Construction Engineering Research Laboratory based on operational data over a two-year period. In limited instances, noise contours for Zone II exceeded the installation's boundaries by as much as 1500 feet in the southern area of the base and noise contours for Zone III extended beyond the installation's boundaries by up to 500 feet. The cessation of the JPG's firing mission in September 1994, eliminated that source of impulse noise impacts beyond the base's boundaries. Limited demilitarization and disposal operations for remaining propellants at the Shunk Farm facility (see Figure 4-11a for location) continue to generate noise beyond the installation fence.

Noise zones for bombing and strafing activities at the air-to-ground gunnery range were generated by use of the NOISEMAP computer program. The aerial track used by aircraft at the air-to-ground gunnery range lies in the northwest section of the base. Noise contours associated with the flight track result in a noise Zone II and Zone III extending as much as 500 feet beyond the northwest boundary of the base. Figure 4-5 shows these noise contours.



4.10 AIR QUALITY

The U.S. Environmental Protection Agency has established National Ambient Air Quality Standards (**NAAQS**) pursuant to Sections 109 and 301 (a) of the CAA. These standards, expressed in micrograms per cubic meter, establish safe concentration levels for each criteria pollutant. NAAQS have been set for six pollutants: particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead. Appendix E provides a listing of federal air quality standards as established by the EPA.

The United States is divided into attainment and nonattainment areas, usually by county or Metropolitan Statistical Area. Areas not meeting NAAQS are designated nonattainment for the specific pollutant.

The State of Indiana has established ambient air quality standards identical to the NAAQS. Air quality monitoring for the state is the responsibility of the Office of Air Management, Indiana Department of Environmental Management. Air monitoring stations throughout the state are grouped into air quality control regions. The JPG lies entirely within air quality control region number 083. Air quality control region number 083 is in full compliance with Indiana and federal ambient air quality standards.

Four air monitoring stations within Jefferson County monitor compliance with ambient air standards. These monitoring stations are primarily used to monitor pollutant concentrations associated with the coal-fired Clifty Creek power generating station. In relation to JPG Headquarters, the monitoring sites are located at:

Wilson Avenue, North Madison, 3.8 miles to the southeast,

K Road (not the "K" Road at JPG), 5.2 miles to the southeast,

Graham Road, 2.4 miles to the northeast, and

Bacon Ridge Road, 5.0 miles to the northeast.

These sites measure concentrations of total suspended particulates and sulfur oxides. At Wilson Avenue, analyses are also made of fine particulates, and at Bacon Ridge Road continuous measurements are also made of nitrogen oxides. These measurements are monitored by the Indiana Office of Air Management and are filed with the EPA Aerometric Information Retrieval System (USACOE 1991).

The Indiana Office of Air Management does not consider the JPG to be a major source of air pollution. Several emissions sources exist on the facility, but cumulatively they do not impact regional air quality. Primary air emission sources at the JPG include three boilers which use fuel oil, the sewage treatment plant, and a single chamber with afterburner incinerator in Building 333. Open burning of excess propellants, detonation of explosives, and firefighter training are considered secondary air emission sources. Ordnance testing activities and normal vehicle use are considered minor mobile sources of air emissions (Foyst, July 1993).

The Air Compliance Section of the Office of Air Management currently holds two letters of registration, one letter of exemption, and a variance permit for the JPG. On April 26, 1978, the JPG was issued a letter of registration for a Plibrico Model 489 multichambered incinerator. The incinerator did not require permitting because its throughput rate was below the state cut-off limit. However, the registration was amended and a permit for the incinerator was issued after its initial registration with the state. On February 25, 1982, the state issued

an exempt operation status letter which superseded the permit. The current status remains in a letter of exemption. The state also has a letter of exemption issued February 25, 1982, for three No. 2 fuel oil-powered boilers located in Building 103. The JPG received a letter of registration for a wood-fired boiler on August 1, 1991. The registration was amended on January 25, 1993, to modify the terms of the air quality conditions in the original registration (Foyst, July 1993). The wood-fired boiler is not currently being utilized (McAlister, January 1994).

4.11 GEOLOGY, SOILS, AND TOPOGRAPHY

4.11.1 Geology

The JPG lies on the western limb of the plunging anticline known as Cincinnati Arch. The installation is located in the Till Plains section of the Central Lowlands Province. The region is characterized by till deposits capping a rolling limestone plateau dissected by deep drainage cuts (USACOE 1991). The site is immediately underlain by deposits of wind-blown nonstratified silts and clays (loess). Underlying the loess is a glacial till of Illinoian and Wisconsinan Age.

Bedrock at the JPG, illustrated in Figure 4-6, consists of thick sequences of interbedded carbonate units of Silurian, Ordovician, and Devonian Age. These include the Louisville Limestone, Salamonie Dolomite, and Brassfield Limestone (Silurian); Maquoketa Group, Trenton and Black River Limestones, and Knox Dolomite (Ordovician); and Muscatatuck Group (Devonian). The majority of rock outcrops at the JPG are associated with the Salamonie Dolomite. Other outcrops of thinly bedded limestones and shales located in some stream drainages are associated with the Maquoketa Group. The Maquoketa Formation is composed of gray calcareous shale with thinly bedded limestone comprising up to 50 percent of the formation (USATHAMA 1992).

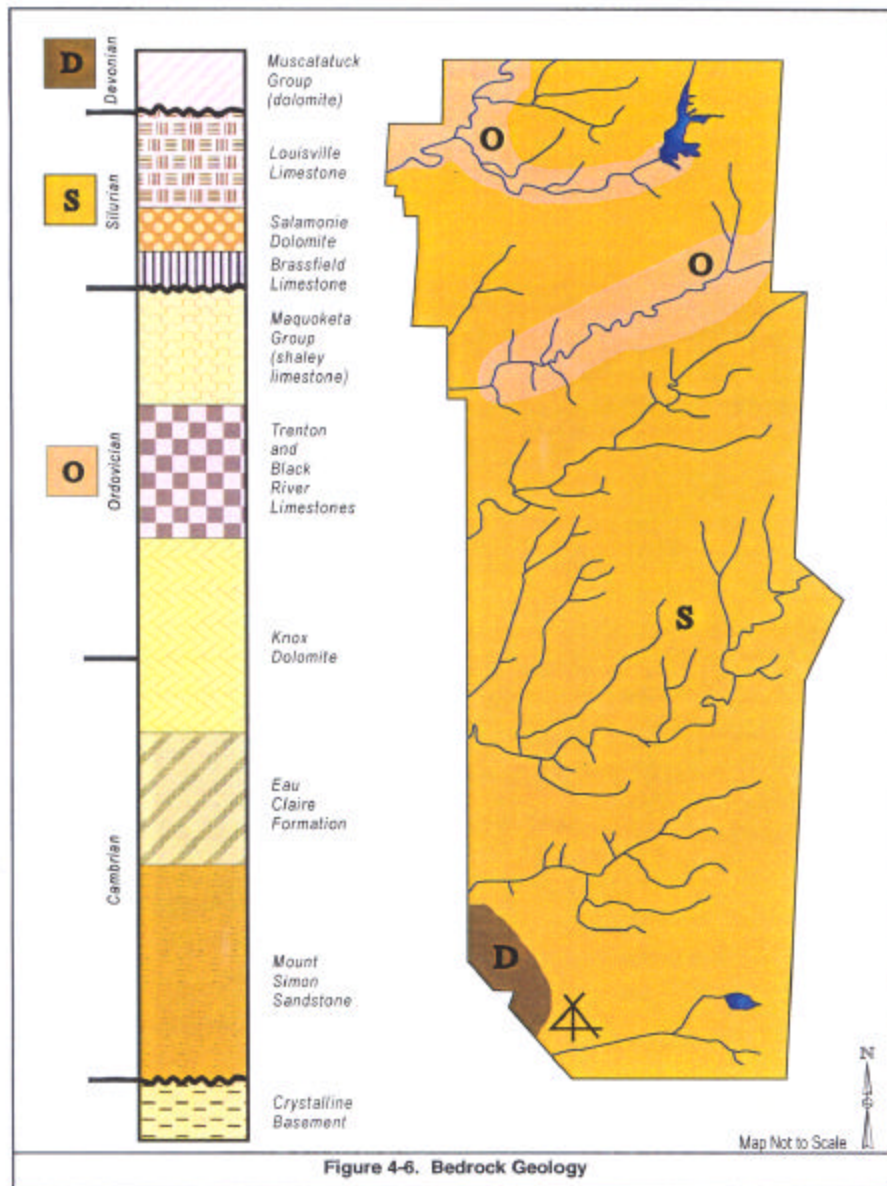
Silurian and Devonian limestones are quarried in southeastern Indiana for aggregate and high purity chemical-stone products. Ordovician rocks are generally too shaly to be of commercial value (USACOE 1991). The economic potential of the bedrock units is described as excellent for Trenton Limestone, poor for the Maquoketa Group, fair for Salamonie Dolomite, poor for Louisville Limestone, and good for the Muscatatuck Group (Shaffer 1981).

4.11.2 Topography

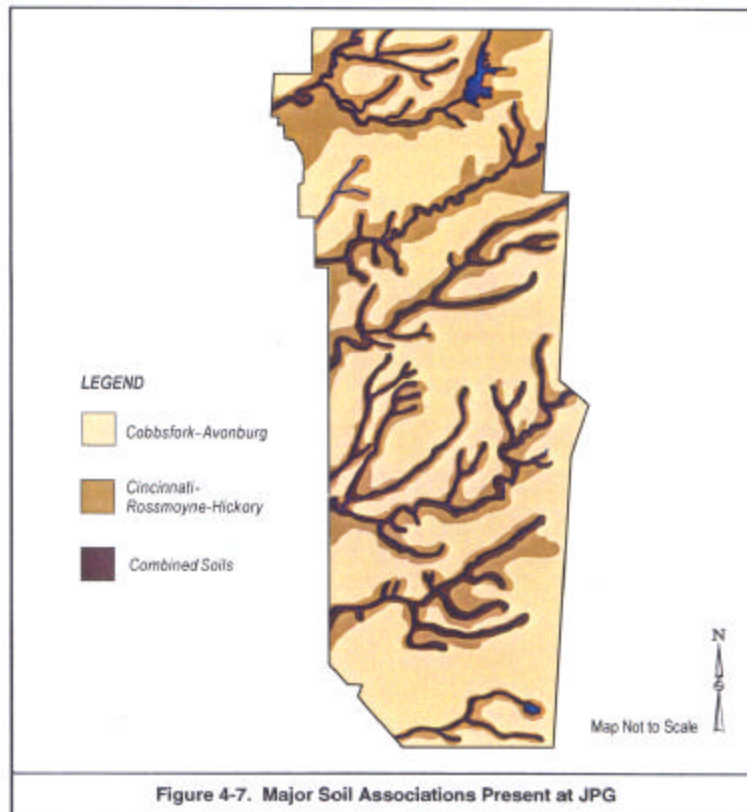
The JPG is located on the Till Plains - Section of the Central Lowlands Physiographic Province. The region is characterized by till deposits capping a rolling limestone plateau dissected by deep rocky valleys. The northern half of the installation is gently rolling, while the southern half is generally flat. Several stream corridors traverse JPG, flowing generally to the west and southwest. Drainage for each of the creeks is well developed, consisting of numerous tributaries. Two man-made bodies of water also exist within the boundaries of JPG. Old Timbers Lake, an impoundment of Little Otter Creek, runs generally north-south in the northeastern portion of the installation. Krueger Lake, a smaller recreation lake created by impounding Harbert's Creek, lies in the southeastern corner of the JPG.

4.11.3 Soils

The two major soil associations present at the JPG are the Cincinnati-Rossmoyne-Hickory and the Cobbsfork-Avonburg (Figure 4-7). A combination of different soil types occur on or adjacent to stream beds. These soils include Ryker silt loam, Grayford silt loam, Holton loam, Eden silty clay loam, Elkinsville silt loam, and Wirt silt loam soil types. The Elkinsville, Ryker, and Wirt soils are considered prime farmland and Holton soils are prime farmland its areas that are drained (USATHAMA 1992).



The Cincinnati-Rossmoyne-Hickory soils are generally deep and moderately well drained, with slopes of 0 to 35 percent. These soils are found mainly on ridge tops, breaks, and hill sides at the JPG. Erosion and slope are the primary limitations in use and management of soils in this association. The silt loams are severely limited as sites for roadways or septic tank absorption fields (USACOE 1991, USDA 1985).



The Cobbsfork-Avonburg soils are nearly level to gently sloping and somewhat poorly drained soils (generally less than 6 percent) located on broad tabular divides. High moisture content and erosion are the primary limitations in use and management of soils in this association. Extensive drainage systems are necessary in this type of soil for urban or agricultural development (USDA 1985). This association occupies more than 40 percent of the JPG's acreage (USACOE 1991).

Both soil associations contain low permeability confining layers which restrict downward movement of water. The Cincinnati-Rossmoyne-Hickory soils are less desirable for development than the Cobbsfork-Avonburg soils due to wetness, poor porosity, and steep slopes. Occasional flooding and erosion are hazards that frequently occur with this association (USATHAMA 1992).

The underlying unconsolidated glacial tills are typically 25 to 35 feet in thickness and reach 50 feet in thickness in the uplands areas. The tills have been eroded and are generally absent in and near stream valleys (USATHAMA 1992).

Erosion is evident throughout the JPG facility, particularly north of the firing line where the numerous streams and their branches have cut deep gullies through the soil. Steeper hillsides show signs of erosion in clearings where ground cover is sparse. Erosion is not as prevalent south of the firing line in the cantonment area.

4.11.4 Prime and Unique Farmland

Prime farmland, as defined by the United States Department of Agriculture's Soil Conservation Service, is land that is best suited to food, feed forage, fiber, and oilseed production. It does not include urban or build-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for a well-managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, and the areas temperature and growing season are favorable. Prime farmland soils have acceptable levels of acidity or alkalinity. Prime farmland also has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6%.

Unique farmland is land that can be used for the sustained production of specific, high-value food and fiber crops. The moisture, regardless if supplied by irrigation or precipitation, is adequate for the high yielding crop. Elevation, length of growing season, drainage, and non-natural elements such as the distance to the market are also factored into unique farmland determinations. As the State of Indiana does not have an established "unique farmland" program, there are no criteria established that can be used to determine if the soils on and around the JPG qualify as unique farmland.

Soil types in the area of the JPG which can be considered prime farmland based on general soil properties include the following silt loams: Cincinnati, Deputy, Elkinsville, Haymond, Huntington, Jennings, Negley, Nicholson, Pekin, Rossmoyne, Ryker, and Wirt. A listing of soil types and potential classifications is provided at Table 4-9. Approximately 30% of the soils at the JPG have the potential to be classified as prime farmland. Disturbances of these soils through military activities such as air-to-ground munitions testing and ordnance detonation decrease the likelihood that the soils would be classified as prime farmland.

4.12 BIOLOGICAL RESOURCES

During the spring and summer of 1993 and 1994, the Bloomington Field Office of the FWS performed biological surveys of the JPG. These surveys included plant surveys, stream fish collection, breeding bird surveys, and bat surveys. The following subsections include information collected from these surveys. The information is contained in the *Jefferson Fish and Wildlife Management Plan September 1994*.

Table 4-9. **Potential Farmland Classifications at the JPG.**

Soil Type	Slope	Classification
Cincinnatic silt loam eroded	2% - 6%	Prime
Cincinnatic silt loam eroded	6% - 12°/a	
Cincinnatic silt loam (severally eroded)	6% - 12%	
Cincinnatic silt loam eroded	12% - 18%	
Elkinsville silt loam	2% - 6%	Prime
Elkinsville silt loam eroded	6% - 12%	
Haymond silt loam (frequently flooded)		Prime'
Pekin silt loam eroded	2% - 6%	Prime
Rossmore silt loam	0% - 2%	Prime
Rossmore silt loam eroded	2% - 6%	Prime
Rvker silt loam	6%- 12%	

4.12.1 Wildlife Resources

The JPG's lands provide habitat for a variety of wildlife. The nature of the mission and activities at the JPG prevents a systematic survey from being conducted. Examples of wildlife species native to the JPG are listed in Appendix F.

From May 28, 1993, through June 17, 1993, 11 areas at the base were surveyed for the presence of breeding birds. The initial study identified 103 species of birds as breeding pairs on the JPG. Of those, approximately 48 percent are neotropical migrants, species that nest in the U.S. and Canada but winter in the tropics of Central and South America.

The three major habitats used by the avian community include the wet woodlands, dry-upland forests, and grass/shrubland areas. The wet woodlands include three of the surveyed sites. The most common birds observed in this habitat were those which prefer forest interior. The dry-upland habitat had three sites surveyed and included areas consisting of mature forested uplands changing to bottomland forest. This community, as with the wet-woodland community, was dominated by those species preferring the forested interior. The grass/shrubland community was dominated by grassland and shrubland species, as expected. Due to the scattered areas of these two habitats throughout the facility, woodland and generalists species were also present. Appendix F lists birds surveyed on the JPG.

One of the largest great blue heron nesting colonies (rookeries) found in Indiana is located within JPG boundaries. This rookery is located in the northeast portion of the property. The rookery has demonstrated steady growth, most likely due to low levels of human activities in the area.

No extensive survey for mammals was performed during the study. Appendix F lists mammals known to inhabit or potentially inhabit the JPG.

Bats were collected at Little Otter Creek, Otter Creek, Graham Creek, and Harbert's Creek between June 21 1993 through June 28, 1993. Seven species of bats were captured and included the species in Appendix F.

These seven species of bats represent a majority of the species that would be expected in the vicinity of the JPG. Only a small fraction of the facility was sampled to collect them. The diversity and extent of habitat types and undisturbed forested stream corridors and karst conditions make it likely that the JPG harbors an abundant bat community.

The region in which the JPG lies is considered herpetologically rich, with herpetiles (reptiles and amphibians) resembling southern and eastern species rather than northern species. Appendix F lists the reptiles and amphibians positively identified on JPG (Karns, 1994).

4.12.2 Aquatic Resources

During the period June 1, 1993, through June 9, 1993, the FWS conducted a fish survey of the JPG's streams. The JPG is located in the Muscatatuck Regional Slope, and the three major streams in this area drain into the Muscatatuck River system. Bottom substrates consist of rock shelf and bedrock in many streams, with rubble/boulder substrates common in some areas. Channel configurations are mostly natural and instream habitat varies from abundant to insufficient in shallow, bedrock areas. Riparian forests along the stream corridors are generally well suited for aquatic habitat protecting the areas from erosion and providing aquatic stability. Erosion is limited to areas of disturbances by construction of roads and barriers. Silt load is found at some levels in some streams and is probably the result of agricultural activities upstream from the base. The larger streams on the JPG are discussed individually.

Otter Creek is in the northern portion of the facility. All direct watersheds of the creek and most of its tributaries within the JPG boundary are forested. Otter Creek has the most varied and least degraded riparian habitat on the facility. Common features on this creek include gravel/rock riffles, boulders, deep pools, rock ledges, and stands of aquatic vegetation, chiefly water willow (*Salix americana*). Water is generally clear except after heavy rains, when it becomes very turbid. This is a third order stream and its size ranges from 36 feet to 61 feet with a mean gradient of 11 feet per mile.

Little Otter Creek is the major tributary to Otter Creek on the JPG. It is abundant with rock/riffle habitat, although much bedrock is present and the creek is too shallow to contain much pool habitat. The mean channel width is 29 feet with a gradient of 26 feet per mile. The banks of this creek are stable with abundant cover of woody vegetation.

Graham Creek is smaller than Otter Creek with less pool habitat, less instream structural habitat, and a higher silt load. Undercut rootwads on the channel banks yields an abundance of predators and other large fish; however, this habitat type is above water much of the year. Riparian forest varies along this creek from abundant to narrow and restricted along some interior reaches. Erosion is presented along isolated sites where construction of roads, barriers, and other disturbances have occurred.

Little Graham Creek has a profound change in habitat quality below the confluence of Horse and Poplar Branch. Upstream of this area, the creek is small, shallow, and silty with moderate habitat quality. Directly upstream of the confluent is abundant

filamentous surface algae. The only spotted sucker (*Minytrema melanops*) caught during the survey was in this stream.

Big Creek is chiefly a shallow run with sand, silt, and/or gravel substrate. Good gravel riffles, small pools, and rock rubble are present. Structural instream habitat is sparse and silt load is relatively high. Riparian forest is ample in some areas and sparse in other areas, especially the interior reaches. Fauna observed along this creek include mink, muskrat, deer, and watersnakes.

The 1993 survey resulted in the collection of 6,703 fish of 41 species and 10 families. Fish were collected from 17 collecting stations along various creeks. Otter Creek was the most productive creek with a total of 39 species from 4 stations collected. The least productive creek was Marble Creek, whose only collecting station collected 31 fish from 8 species. No endangered, threatened, or rare species were found in any of the creeks on the facility. The most common fish type was minnows, making more than one half of the total fish population. A list of fish species is found in Appendix F. Benthic fishes were common in portions in other streams also but were generally not as diverse as in Otter Creek. Game fish (black bass and panfish) are present in all streams of sufficient size, and are common in some reaches.

The FWS observed mussel shells and live mussels in all of the major streams. The FWS did not perform a comprehensive mussel survey, but a survey was conducted on a section of Otter Creek crossing the JPG during June 1994. Species identified (live or recently dead) from that survey are listed in Appendix F. In addition, FWS is currently collecting macroinvertebrate samples which will aid further in quantifying the aquatic resources at the JPG.

4.12.3

Plant Resources

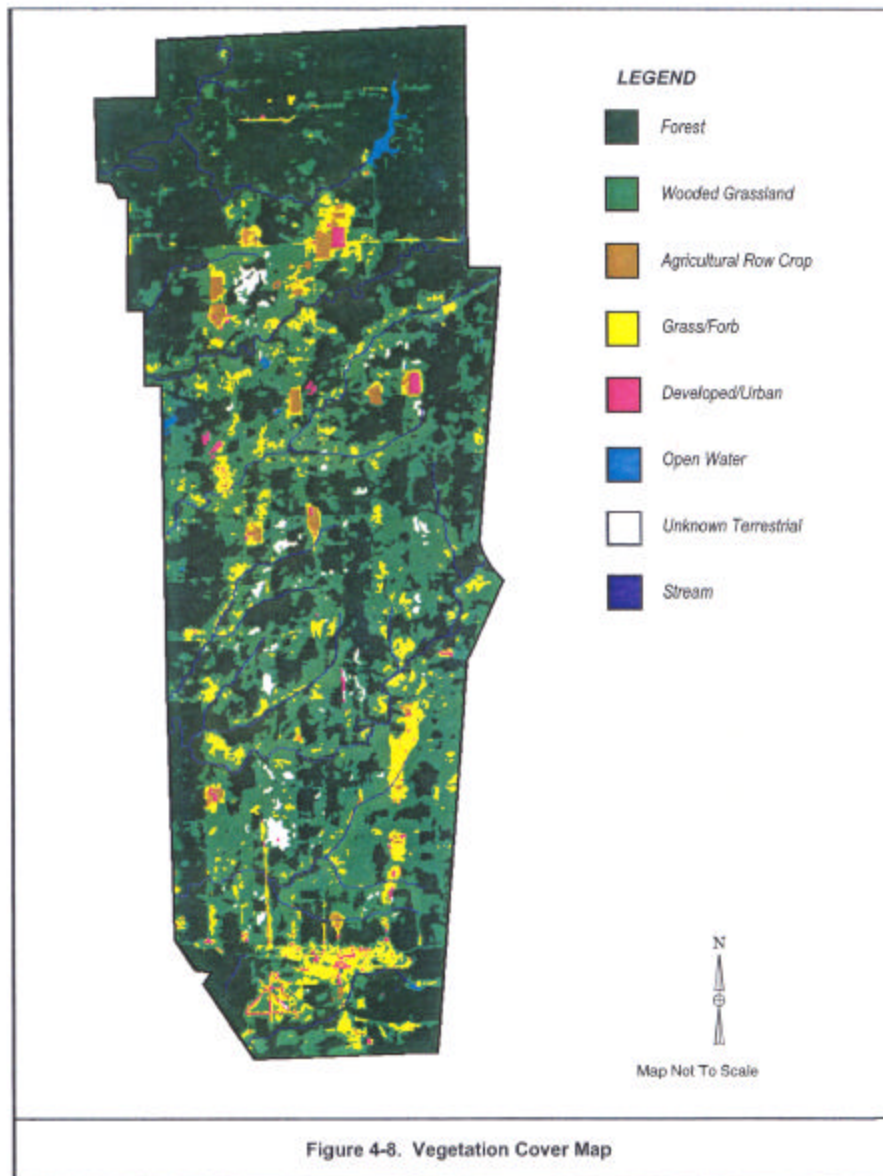
The JPG is diverse with vegetation resources and contains a large variety of community types, from frequently burned meadows to mature hardwood forests. It supports unique vegetation associations that include numerous federal and state-listed plants (endangered, threatened, candidate, and special concern). In the past, the JPG's lands consisted mostly of forests which were predominantly flatwoods. Flatwoods are forested areas that occur on level or nearly level soils which are poorly drained, having a shallow, perched water table. Many of the former flatwoods were cleared and used as cropland prior to purchase of the area in 1940 by the U.S. Army. They have since reverted to successional woodlands or have been maintained as meadows through regular prescribed burnings.

More than 75 percent of the JPG land area is forested. Dominant tree species are presented in Appendix F.

Approximately 43 acres of white pine can be found near Old Timbers Lodge. Stands of conifers are scattered throughout the facility. A vegetation cover map is presented in Figure 4-8.

Spicebrush and flowering dogwood are dominant understory species. Herbaceous groundcover include a variety of ferns, sedges, groundpine, and numerous wildflowers such as orchids, asters, and goldenrods. The meadowlands support a variety of both uplands and wetlands species. Natives such as green-fringed orchids, rose-pink, flax, butterflyweed, early goldenrod, narrow-leaved mountain mint, hardhack, and sedges occur along with non-native Japanese lespedza and white sweet clover.

Approximate acreage, board-foot volumes, and value of harvestable hardwood timber as of July 1994 located on the JPG are shown in Table 4-10. The 22,378 acres are primarily located along the perimeter fence of the installation and throughout the cantonment area. A Forest Management Plan was developed in 1989. Timber harvesting is based on timber



stand improvement, whereby the most mature trees are removed. The Corps of Engineers has conducted sales of timber every 15 to 18 months. A Corps representative escorts the timber firm during cutting. Each sale results in the removal of 300-400,000 board feet of timber.

Table 4-10. Hardwood Stands on JPG.

County	Acres	Volume (Board-feet)	Value (\$)
Jennings	7,204	9 948,000	2,305,000
Jefferson	5,763	8 030 000	1,423 000
Ripley	9,411	21,445,000	4,895,000

4.12.4 Wetlands

There are approximately 6,000 acres of wetlands on the JPG. Linear riverine wetlands associated with the base's streams extend approximately 69 miles along stream banks. Palustrine forested and palustrine scrub-shrub wetlands are common on the JPG and are characterized by slightly mature, broad-leaved deciduous trees varying in height from 10 to 20 feet.

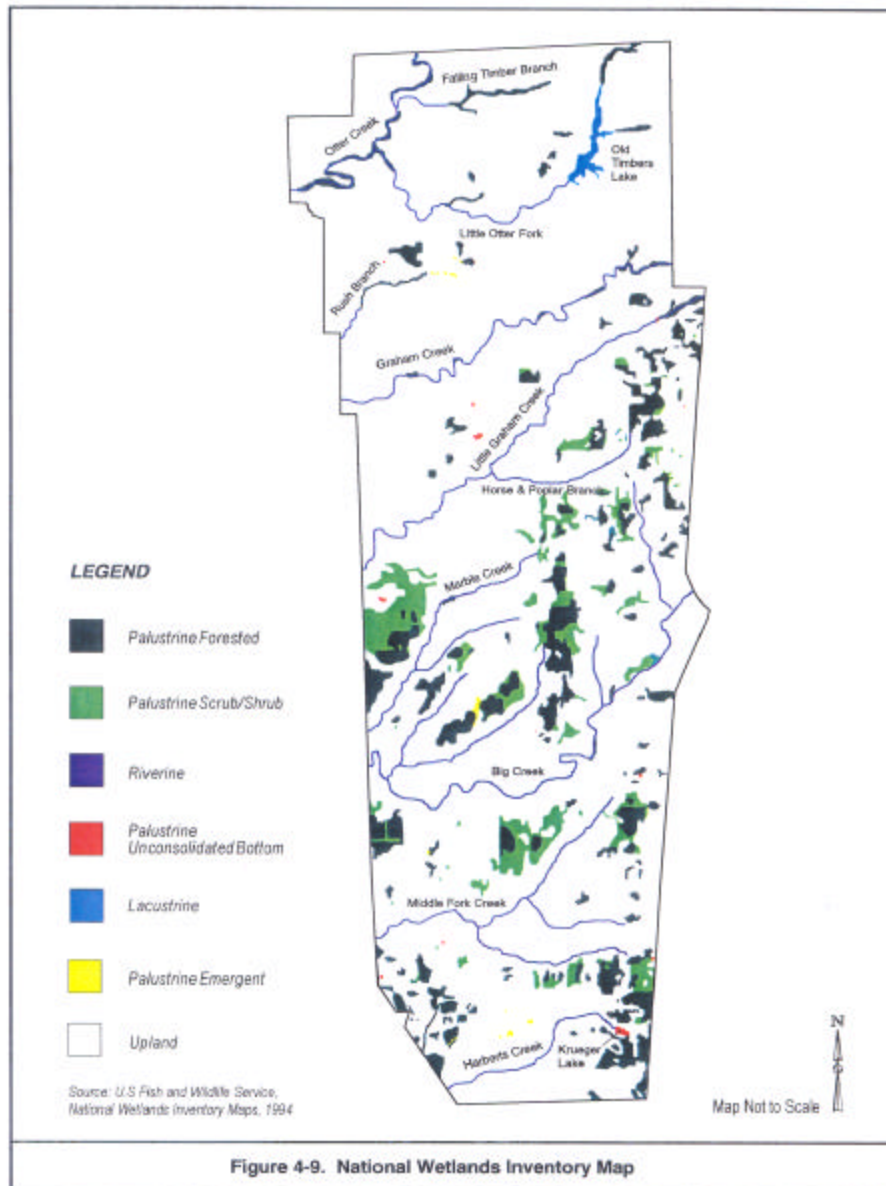
The FWS National Wetlands Inventory maps indicate three major wetlands regions on the JPG. The first wetland area covers about 175 acres of the Bigcreek headwater area along the eastern boundary of the facility in an area 6.5 miles north of the firing line. The second region, about 525 acres, is located near the headwaters of Marble Creek, along the western boundary of the JPG five miles north of the firing line. The third wetland region is located near the headwater area of Little Graham Creek. This area encompasses approximately 475 acres near the eastern boundary of the facility and is 11.5 miles north of the firing line (Mason & Hanger, 1992). Wetlands areas are shown in Figure 4-9.

4.12.5 Federally Listed Threatened and Endangered Species

The JPG provides roosting and foraging areas for the federally endangered Indiana bat (*Myotis sodalis*). The unfragmented acres of forested streams provide corridors for these bats. Based on the habitat available and the preliminary data collected during the FWS surveys, it is likely that the JPG facility supports a large population of the Indiana bats. In addition, although federally endangered gray bats (*Myotis grisescens*) were not captured, the area contains suitable habitat to support the species (FWS, 1993).

The Indiana bat uses woodland during the summer when maternity colonies utilize trees with loose barking for nesting. These bats forage primarily over wooded stream corridors, although they have been collected in grazed woodlots, mature deciduous forests, and pastures with trees. Ideal foraging habitat consists of wooded riparian corridors with adjacent wooded uplands.

A pregnant female Indiana bat was captured on June 25, 1993, at Graham Creek. A male Indiana bat was captured and radio-tagged at the same site on June 28, 1993. The following morning, the male's day roosting area was identified. Later that evening, the bat again was located and his foraging locations were mapped.



The bald eagle (*Haliaeetus leucoccephalus*), until recently a federally endangered species, and the short-eared owl (*Asio flammeus*), a State of Indiana endangered species, have been observed on the base during the winter but do not currently breed on the base. Running buffalo clover (*Trifolium stoloniferum*), a federally endangered plant, has not been found at the JPG, but suitable habitat may exist. Running buffalo clover is found in Switzerland County, which lies east and south of Jefferson and Ripley Counties.

The salamander mussel (*Simpsonia ambigua*), a Federal candidate species, and the Henslow's sparrow (*Ammodramus henslowii*), a state of Indiana and Federal candidate species, are also known to exist on the JPG.

4.12.6 State Endangered, Threatened, and Special Concern Species

The size and variety of habitats found on the JPG allow a number of state endangered, threatened, species of special concern, and candidate species to inhabit the area. These species are listed in Appendix F.

In addition to the species above, various plant species found on the JPG property are state listed. These plants are listed in Appendix F.

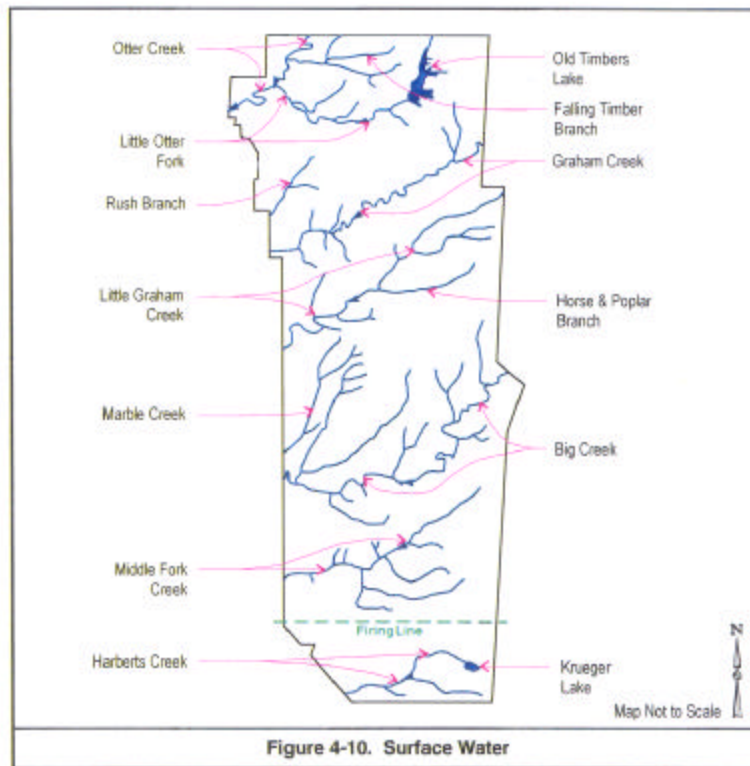
4.13 WATER RESOURCES

4.13.1 Surface Water

The JPG sustains an extensive network of surface water bodies, including intermittent and permanent streams, rivers, and 10 ponds/lakes ranging in size from one to 165 acres. These are shown in Figure 4-10. The FWS stocks many of these surface water bodies with game fish. The streams have no segments listed in the Nationwide Rivers Inventory, nor are they a part of the National Wild and Scenic River System (Mason & Hanger 1992). All surface water bodies at the JPG are classified as "warm-water aquatic and full-body contact" by the State of Indiana Water Quality Standards (Clark 1993).

The JPG lies within the White River Drainage Basin (a sub-basin of the Wabash River Basin, which is a sub-basin of the Ohio River Basin) (USACOE 1991). Seven permanent streams flow across the JPG, generally moving in a northeast to southwest direction. The streams include Otter Creek, Graham Creek, Little Graham Creek, Marble Creek, Big Creek, Middle Fork Creek, and Harberts Creek.

Otter Creek is the northernmost stream at the JPG, draining approximately 10,690 acres as it flows 5.2 stream miles across the facility. Little Otter Creek is located south of Otter Creek and flows 4.0 stream miles (draining Old Timbers Lake) before converging with Otter Creek. Old Timbers Lake is approximately 165 acres (Mason & Hanger 1992). Otter Creek and its tributaries cut into the underlying limestone. Little Graham and Graham Creeks originate offsite and flow independently across the JPG. Graham Creek flows 7.6 stream miles across the JPG property and drains approximately 5,870 acres. Little Graham Creek flows 7.8 stream miles across JPG property and drains approximately 7,760 acres. Little Graham Creek converges with Graham Creek 2.4 stream miles from the JPG boundary. Both Little Graham and Graham Creeks have gravelly substrates. Big Creek originates off-site and flows 9.2 stream miles across the JPG. It is fed by numerous unnamed intermittent tributaries and has a sandy/gravelly substrate. Marble Creek originates on the JPG property, flowing 2.6 stream miles as a permanent stream to the installation boundary. It flows another stream mile before joining Big Creek. Marble Creek has a rock substrate and is cut into the underlying limestone. Together, Big Creek and Marble Creek drain approximately 11,460 acres of the JPG.



Middle Fork Creek originates on the JPG and is subsequently fed by several unnamed intermittent tributaries. It has a gravel substrate and meanders 2.6 stream miles across the facility, draining 6,520 acres.

The Harberts Creek headwaters are fed by two intermittent tributaries which originate on the installation. One of the tributaries originates in Krueger Lake (8 acres). Harberts Creek flows 1.8 stream miles across the JPG and drains approximately 6,110 acres. The JPG's wastewater treatment plant is located on this creek at the base's western boundary. An average discharge of 13.0 cubic feet per second has been recorded for Harberts Creek at a United States Geological Survey gaging station near Madison, Indiana.

Monitoring programs to protect and assess surface water quality at the JPG include National Pollution Discharge Elimination System permit measurements at the wastewater treatment plant and the Depleted Uranium monitoring program. The U.S. Army Environmental Hygiene Agency and the Department of the Interior occasionally perform studies on the surface water. With the exception of lead, contaminants potentially attributable to JPG's operations have not been found in the analyses.

4.13.2 Groundwater

Two hydrostratigraphic units underlie the JPG. They are unconsolidated glacial deposits and Silurian and Devonian Limestones. Low hydraulic conductivity and small hydraulic gradients result in slow groundwater movement in the unconsolidated glacial deposits. Groundwater flow in these deposits roughly imitates the surface topographic flow (Mason & Hanger 1992). The capacity of groundwater in the glacial deposits is not capable of sustaining constant recharge and is not considered as a domestic water supply. This is due to the intermittent nature of water bearing zones and the low permeability of the till units. The water is generally hard, with potentially high sulfur content.

Groundwater in the vicinity of the JPG is primarily stored in Silurian and Devonian Limestone aquifers. The Brassfield Limestone is the principal water producing aquifer of the Silurian and Devonian Limestones in the JPG area. The Brassfield Limestone has low primary porosity and poorly developed secondary porosity that provides for the majority of groundwater recharge. The limestone aquifers in this region are confined by the overlying fine-grained glacial material. Well depths range from 50 to 250 feet and yields range from 10 to 100 gallons per minute (USACOE 1991).

The JPG has no comprehensive, base-wide groundwater monitoring program. Monitoring wells were installed around the Gate 19 landfill in 1982. Samples collected in 1982 and 1983 contained low levels of volatile organic compounds; samples collected in 1984 did not. Based on the probable groundwater contamination at this landfill and other locations on the installation, a Remedial Investigation was initiated and several monitoring wells were installed south of the firing line. Analyses suggest that any groundwater contamination south of the firing line is localized due to slow groundwater movement, estimated to be 15 feet per year at the landfill and 2.92 feet per year at Building 279.

Possible sources of groundwater contamination include landfills other than the Gate 19 landfill, solvent disposal areas, red lead disposal areas, yellow sulfur disposal areas, underground storage tanks, burn areas, and ordnance impact areas. Pending completion of the Remedial Investigation / Feasibility Study being prepared as part of the Installation Restoration Program, the extent and causes of groundwater contamination cannot be fully determined (USACOE 1991). Groundwater at JPG is not utilized as a potable water source (Mason and Hanger 1992).

4.14 HAZARDOUS MATERIALS AND HAZARDOUS WASTES

4.14.1 Regulation of Hazardous Materials and Waste

Numerous regulations govern the generation, treatment, storage, and disposal of hazardous materials and hazardous wastes. Regulations pursuant to Subtitle C of the Resource Conservation and Recovery Act pertain to the treatment, storage, and disposal of hazardous wastes. The EPA or an authorized state issues RCRA Part B permits for treatment, storage, and disposal of hazardous wastes. Hazardous materials regulations of the Department of Transportation govern transportation of hazardous materials. Occupational Health and Safety Administration regulations pertain to site worker health and safety. Other regulations derived from federal statutes that are applicable to JPG operations include those associated with the Toxic Substances Control Act, the Nuclear Regulatory Commission, and the Clean Air Act.

The JPG has submitted a Part A RCRA permit application and thereby attained interim status and authorization for the thermal treatment of propellants and explosives at open burning and detonation facilities. While the JPG also has submitted a Part B RCRA permit application for open burning and detonation units, the Part B application has no legal effect until a RCRA

permit is issued. A closure plan for the open burning facilities is scheduled for completion in September 1995 and for open detonation facilities at a later time. The JPG also uses a temporary storage facility for hazardous waste (Building 305); the State has approved the closure plan for that site.

Programs to remedy past, present, or threatened uncontrolled releases of contaminants from hazardous site were established by the Comprehensive Environmental Response, Compensation and Liability Act. CERCLA requires that all federal property transfers specify any release, storage or disposal of hazardous materials at the site along with a description of the circumstances and any response taken. Covenants are required for property transfers from the federal government to private nonfederal government entities that involve property which has been the site of storage, release or disposal of hazardous materials. These covenants must warrant that necessary remedial action has been taken and, that if additional remediation is needed, it will be conducted by the federal government.

In October 1992, the CERFA amended CERCLA to establish new procedures with respect to contamination assessment, cleanup, and regulatory agency notification and concurrence for federal facility closures. The objective of CERFA is to readily identify real property that has potential for immediate reuse.

4.14.2 Investigations and Source Areas of Hazardous and Toxic Materials

The JPG's operations throughout the base's history have involved use of a wide variety of hazardous materials and petroleum products. Several studies have been performed to support DoD environmental restoration program initiatives and BRAC activities to identify where these materials were used, stored, or released. The more important of these studies are briefly described below. The *CERFA Report for Jefferson Proving Ground* (December 1993) contains additional references to information on environmental restoration studies that have been completed.

A Draft RCRA Facility Assessment Report completed by the U.S. Environmental Protection Agency's Region V office identified 85 solid waste management units at JPG. In addition, JPG officials have identified another 31 sites.

An Enhanced Preliminary Assessment was conducted by the USATHAMA to assess environmental quality at the JPG in March 1990. The Enhanced Preliminary Assessment was performed through visual inspection of the JPG and review of all available documents and files. Fifty-three areas requiring environmental evaluation were identified. In addition to focusing on hazardous waste sites, the study addressed the JPG's regulatory compliance status, PCBs, asbestos, lead-based paint, radon, underground storage tanks, environmental issues requiring resolution, and current or potential restraints on utilization of the JPG.

In April 1994, the U.S. Army Environmental Center (USAEC) published the Version I of the *Base Realignment and Closure Cleanup Plan, Jefferson Proving Ground*. The document contains the status, management and response strategy, and action items related to the JPG's ongoing environmental restoration and associated compliance programs. Appendix F of that document ("Other Ancillary BCP Materials") contains a thorough listing of JPG's known and potential hazardous waste sites. It is included in this EIS at Appendix G to provide general information on the location, status, and potential or intended actions respecting those hazardous waste sites.

A draft report pursuant to the CERFA was prepared on December 1, 1993. This document identified four CERFA parcel types:

1. CERFA Parcel - real property that had no history of hazardous materials or, having been contaminated by non-CERCLA hazards (e.g., asbestos, UXO), is fully remediated; this type of property is available for immediate reuse.
2. CERFA Parcel with Qualifier - those parcels that contain non-CERCLA and petroleum/petroleum derivative hazards such as radon, asbestos, unexploded ordnance, lead-based paint, radionuclides or inactive equipment containing PCBs.
3. CERFA Disqualified Parcel - real property where there is evidence of storage, release, or disposal of a CERCLA hazardous substance, petroleum, or petroleum derivative, or evidence that the parcel is threatened by such release or disposal. CERFA Disqualified Parcels also include any portion of the installation containing PCB release or disposal, any explosive ordnance dumping locations, any storage sites of chemical ordnance, and any areas in which CERCLA-hazardous substances or petroleum products have been released or disposed and subsequently fully remediated.
4. CERFA Excluded Parcel - those areas that are either to be retained by DoD (and therefore not explicitly investigated under CERFA) or previously transferred by deed to another agency or party outside the federal government.

According to the draft CERFA Report (ETC, 1993), three of the four parcel types were applicable at the JPG: CERFA Parcels, CERFA Disqualified Parcels and CERFA Parcels with Qualifiers. As of the close of 1994, the draft report was under review by State of Indiana environmental officials. Figures 4-11 a and 4-11 b show the location of each parcel; Table 411 describes each CERFA parcel and its parcel type.

Areas south of the		firm line			
St Area	Total Acres	D ¹	Q ²	E ³	P ⁴
1D-/X/HR	36	0	0		
3D-/NL1X/PR/HR P	40	0	0		
5D-/ANPR/PS P /HR/HS	30	0	0		
8D-/AAJX/RD/PR/HR	10	0	0		
7D-/ANP/X/RD/PR/PSAHRAJS	450	0	0		
8D-/AAJX/PR	10	0	0		
10D-/A/VPS/HS	10	0	0		
13D-/AA-/PS/HS	10	0	0		
15D-/X P /HR P	10	0	0		
19D-/PR P	10	0			
23D-/HR P /HS	10	0			
28D-/A/LX P /PS/HR P	100	0	0		
29D-/X P /HR P	120	0	0		
30D-/AMPS P /HR/HS	38	0	0		
31 D-/X P /HR P	10	0	0		
32D-/HR	20	0			
33D-/HR P	30	0			
2Q-/A/L/X/RD	1679		0		
12Q-/A/URD	20		0		
14Q-/A/L	30		0		
16Q-/A/L	10		0		
17Q-/A/L	30		0		
18Q-/A/L	10		0		

Table 4-11. CERFA Acres Stu Area.					
20Q-/A/L	10		0		
210-/A			0		
220-/AIL	9		0		
240-/A/L	10		0		
260-/AIL	10		0		
270-/A/L	10		0		
4P	3078				0
9P	8				0
11p	10				0
25P	10				0
Areas north of the firing line					
2D-/X/PS/HR P /HS	130	0	0		
3D-/UHR P	50	0	0		
4D-/VHR P	40	0	0		
5D-/X/HR P	160	0	0		
6D-/X/HR P	40	0	0		
7D-/XIHR P	60	0	0		
8D-/XIHR P	60	0	0		
9D-/RD P R	1620	0	0		
10D-/X/HR P	210	0	0		
11 D-/X/HR P	50	0	0		
12D-/X/PR	20	0	0		
10-/X	47696		0		
1 CERFA Disqualified Parcel (see text for definition)					
2 CERFA Parcel with Qualifier (see text for definition)					
3 CERFA Excluded Parcel (see text for definition)					
4 CERFA Parcel see text for definition					

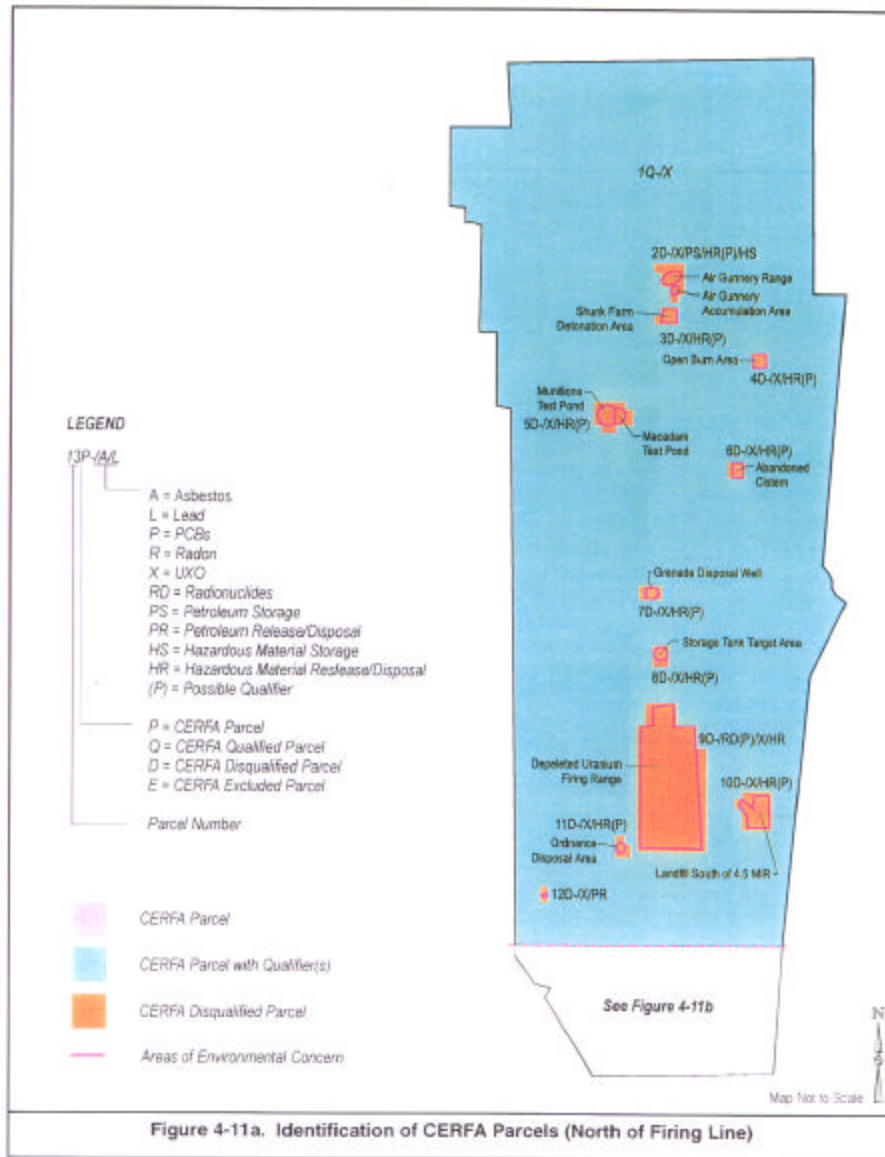
Source Earth Technology Corporation, 1993

The CERFA process addresses potentially contaminated areas in terms of acres. Specific remedial actions are accomplished at smaller, more precisely defined project sites. Corrective actions are, or will be, occurring at numerous sites throughout the installation as part of the Installation Restoration Program. Individual projects are developed and funded according to various regulatory requirements and funding accounts.

In September 1992, a Draft Technical Plan was prepared to perform an RI/FS for 22 solid waste management units and three additional sites south of the firing line at the JPG. The Army conducted field work in two phases in order to maximize placement of monitoring wells. Field work was conducted in 1992 and 1993. The Final Draft RI Report was provided for review in July 1994. The Army plans to perform cleanup activities as required; however, the schedule for cleanup activities is not known. The overall objective of the Army is to provide, wherever possible, parcels that are environmentally suitable for disposal and that can be readily disposed and made available for reuse.

4.14.3 Unexploded Ordnance

Due to historical practices at the JPG, unexploded ordnance (UXO) may be found anywhere north of the firing line. South of the firing line, UXO may be found in specific places; these are being investigated either because of known ordnance activities at a site or because there is some evidence of possible ordnance activities at a site. JPG officials estimate that approximately 23 million rounds have been fired into impacts areas north of the firing line since 1941. The types of munitions tested vary from 20 millimeter small caliber cannon to 2,000 pound bombs. It is estimated that as many as 1.5 million UXO items may exist within



Map Not to Scale

Figure 4-11b. Identification of CERFA Parcels (South of Firing Line)

Clearance Depth	Scenario	Bare Land Cost per Acre	Forested Land Cost per Acre
4'	Best Case	\$8,509	\$11,062
4'	Worst Case	\$16,850	\$21,906
10'	Best Case	\$29,782	\$44,248

Table 4-12. UXO Cleanup Cost Estimates

Clearance Depth	Scenario	Bare Land Cost per Acre	Forested Land Cost per Acre
10'	Worst Case	\$58,977	\$87,624

4.14.4 Depleted Uranium

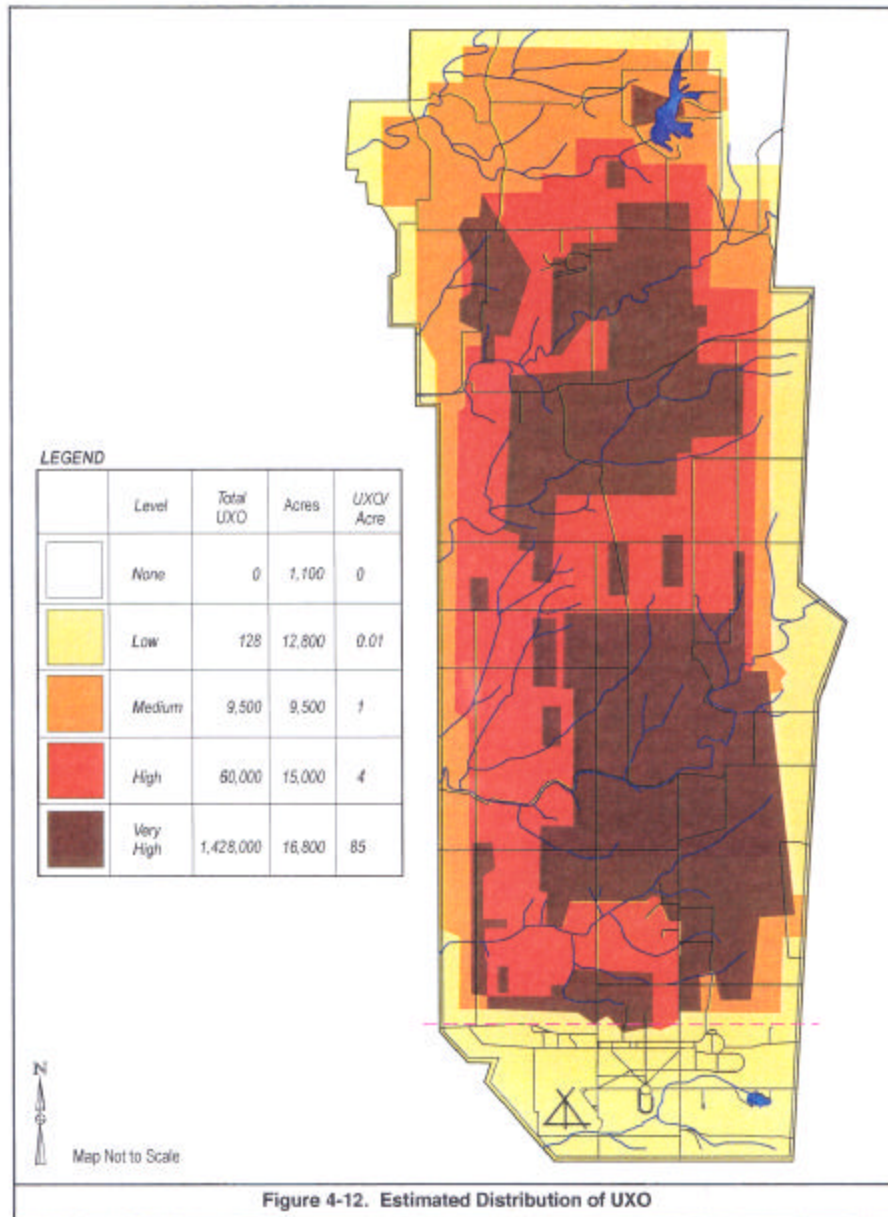
Since March 1984, more than 100,000 kilograms of depleted uranium (DU) projectiles have been fired into a three square mile DU impact area. Figure 4-13 identifies the location of the DU impact area. The presence of the DU gives rise to an encumbrance on disposal or transfer of the DU impact area portion of the JPG. Depleted uranium testing was conducted in accordance with Nuclear Regulatory Commission license number SUB 1435, approved in December 1983. This license permits testing of up to 250,000 kilograms in the DU testing area (105 millimeter and 120 millimeter tank ammunition), storage of DU in Buildings 610, 611, and M1, and storage of up to, 50 kilograms of DU for use as a collimator for a photographic x-ray machine. Semiannual cleanup activities have resulted in recovery of about 25 percent of the DU in the impact area. Although not required by license number SUB 1435, the JPG has taken actions to recover and dispose of spent DU rounds in order to extend the useful life of the impact area. A decommissioning plan is required to be submitted to the Nuclear Regulatory Commission to identify methodology for cleanup of DU contamination and closing out of the license.

In 1994, the Army's Test and Evaluation Command commissioned Los Alamos National Laboratory to study human health risks posed by DU at the JPG. The Laboratory's report, *Depleted Uranium Human Health Risk Assessment, Jefferson Proving Ground*, addresses risks associated with three scenarios: hunting or occasional use, resident farming (drinking water from uncontaminated off-site sources), and resident farming (use of on-site, presumed contaminated water). Both a steady-state model and the Department of Energy's Residual Radioactive Material Guidelines model were used to develop the risk assessment. In the hunting scenario, total dose to humans was modeled to be about 0.15 millirems per year. In the first farming scenario, total dose to human was modeled to be about 1.3 millirems per year. The final scenario, which assumed ingestion of food grown on the impact area and intake of water from a presumably contaminated aquifer, resulted in a modeled dose in years 10 through 100 of about 110 millirems per year, an amount that exceeds the exposure limit of 100 millirems per year (Los Alamos National Laboratory, 1994). To put these doses in context, it is noted that an average American's annual radiation exposure from all natural and man-made sources is 360 millirems; two packs of cigarettes daily results in exposure of about 8,000 millirems per year (polonium-210), porcelain dentures about 1,500 millirems per year (uranium), and each dental x-ray about 100 millirems (Department of Energy, 1994).

4.14.5**Asbestos, Radon, Lead-based Paint, PCBs**

The JPG management of hazardous materials and waste extends not only to materials as they are used and subsequent remedial actions as required, but also asbestos, radon, leadbased paint, PCBs, and underground storage tanks (USTs). Information on these is presented below.

Asbestos. Management and disposal of asbestos at the JPG is performed in accordance with Occupational Safety and Health Administration regulations (29 CFR 1926.1101) and National Emission Standards for Hazardous Air Pollutants (40 CFR 61, Subpart M). Asbestos containing materials are present in several



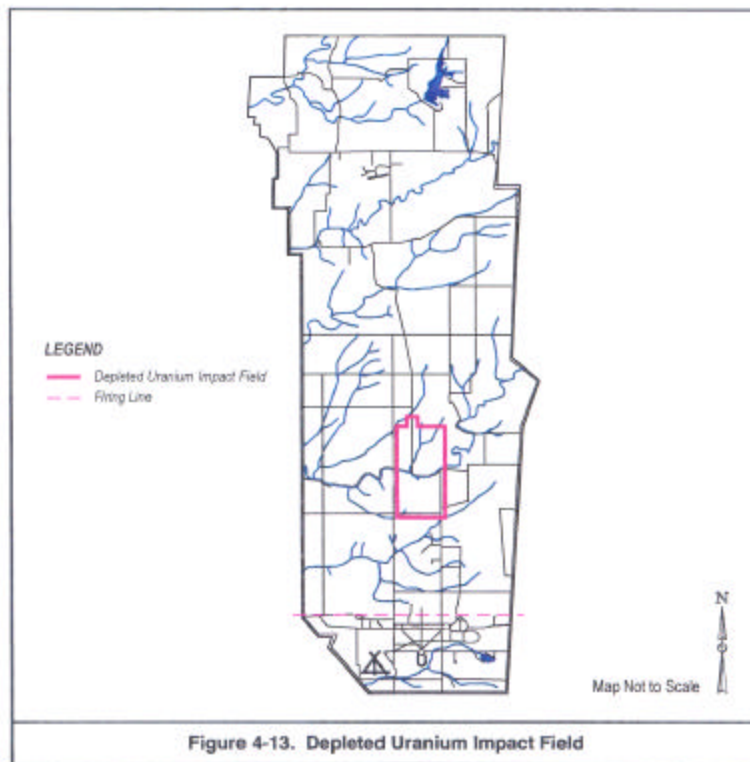


Figure 4-13. Depleted Uranium Impact Field

of the buildings at the JPG facility. Construction materials include pipe insulation, roof shingles, and siding. A preliminary survey at the JPG indicated that the total length of asbestos insulated pipe was approximately 197,000 linear feet. There is also an estimated 258,000 square feet of asbestos shingles and siding. The piping, insulation, and shingles are generally in good, bound, and nonfriable condition. However, many piping joints (unions, elbows, etc.) in many of the buildings have potential to become friable (USATHAMA 1992).

In March 1993, a comprehensive asbestos survey was completed which located, identified, and recommended appropriate abatement action for asbestos containing material. A total of 345 buildings were inspected. No buildings were found to require immediate abatement action. Minor asbestos containing material abatement actions have occurred during operation and maintenance activities. Waste asbestos containing materials resulting from these actions were double-bagged and stored in Building 305 prior to disposal at the Gate 19 landfill.

- **Radon.** Radon testing at the JPG has been performed in family quarters, building basements, and shelter tunnels throughout the facility. Testing for radon was done by 7-day, 90-day, and 12-month tests. Test results indicate radon concentrations at

levels lower than the EPA action level of four picocuries per liter. No further radon testing or mitigation is deemed required at the JPG (USACOE 1991).

Lead-based Paint. A lead exposure risk assessment was conducted at the JPG in October 1991 for the 13 family housing units, all of which were built before 1978. As assessment score for each structure was based on the age of the building, its exterior condition, its interior condition, documented cases of lead poisoning, and special considerations. Based on this ranking protocol, all 13 sets of quarters received a rating of medium risk.

The remaining buildings at the JPG have not been surveyed for lead-based paint. All structures built before 1978 are assumed to contain some amounts of lead-based paint. Of the base's 379 buildings, only 25 have been built since 1978. The Gate 19 landfill may have been used to dispose of empty lead-based paint containers and paint sludge from the paint shop in Building 136 (USATHAMA 1990).

PCBs. Of 252 transformers in use at the JPG, seven have been found to exceed the Toxic Substance Control Act limit of 500 parts per million PCBs and have been replaced. None of the transformers showed indications of leaking.

Throughout its operational history, the JPG has utilized 70 USTs ranging in capacity from 300 to 25,000 gallons to store fuel oil, diesel fuel, kerosene, white gas and gasoline. Twenty-eight of these tanks were installed between 1941 and 1953. Tanks at the JPG are of various construction, from bare steel to coated steel. Currently, the USTs hold No. 2 fuel oil, unleaded gasoline, and diesel fuel (USATHAMA 1992), as well as used motor oil.

The JPG closed and removed ten USTs in 1988. Soil samples at these sites indicated total petroleum hydrocarbons ranging from 400 parts per million to 4,400 parts per million. Indiana's Yank-a-Tank Program requires removal and soil excavation where total petroleum hydrocarbons exceed 100 parts per million. The JPG established two biocells to treat such soils. Selected tanks were tested in 1990 and 1993; resulting in discovery of minor contamination limited to the immediate areas of some tanks.

To date, 32 tanks have been closed and removed. The current management plan is to leave the remaining tanks in place until a final reuse plan is identified and approved, at which time they would be replaced or removed in accordance with all applicable regulatory requirements by 1998 (USAEC, April 1994).

4.15 IDENTIFICATION OF ENCUMBRANCES

The following provides detailed discussion of nine encumbrances and their applicability to the disposal alternatives for the JPG:

Unexploded Ordnance. The Army estimates that there are up to 1.5 million rounds of UXO and up to 7.0 million inert projectiles with live fuses or spotting charges scattered across the impacts areas north of the firing line at JPG. The presence of UXO constitutes a hazard to numerous kinds of activities that might occur in the area such as construction, intrusive investigation of hazardous waste site contamination, cross-country vehicular travel, and most agricultural and silvicultural operations. Removal technology to eliminate potential hazards is inadequate for the extent of the UXO contamination. Restrictive covenants may be included in the sale or transfer documents to prohibit future owners from all terrain-disruptive activities and to impose other requirements to ensure safety and protection of human health and the environment.

Depleted Uranium. Testing of 105 millimeter and 120 millimeter tank ammunition containing DU since 1984 results in there being approximately 75,000 kilograms DU remaining in a three square mile impact area in the central portion of the base. The DU rounds, or penetrator rounds, use nonexplosive projectiles. Most remain intact upon firing, though some break into pieces on impact. The penetrators tend to skip and ricochet when they impact the ground because they are fired at a high initial velocity. The DU penetrators oxidize in the air, forming uranium oxides that can flake off and remain in the soil after recovery of the penetrators. DU represents a toxicological hazard as a metal. Potential release mechanism include the migration of radioactive contaminants through soils to the groundwater. The JPG conducts semiannual groundwater sampling from nine impact area wells and two background wells; to date, no analyzes have shown migration of radioactive materials through soils to groundwater. A decommissioning plan for closure of the DU range will include continued site and groundwater monitoring. In light of DU's lengthy natural degradation period, the continued attention that will be required of potential DU issues represents an encumbrance on disposal or transfer. Additionally, restrictive covenants in sale or transfer documents may be required to ensure safety and protection of human health and the environment.

Surface Water Quality Protection. The FWS request for lands to create a wildlife refuge is expected to lead to management of the refuge area, for the benefit of plants and wildlife, in the most natural condition possible. Consistent with this, during Army-FWS transfer negotiations it may be prudent to provide for restrictive covenants respecting commercial development that might impact surface waters. The Army may find it desirable to include set-back provisions prohibiting construction of buildings or impervious surfaces within any distance that could affect the numerous streams and water bodies draining the JPG. Other actions the Army could take to protect surface water quality would include deed prohibitions on backwoods low-water crossing, prohibitions on boat motors and other recreational motor-powered devices, and best management practices for pesticide applications and silviculture.

Air Gunnery Range buffer. Continuation of Indian Air National Guard's use of 1,033 acres for an air gunnery range in the north-central portion of the JPG would require establishment of safety buffer zones flanking the range and noise easements to permit aircraft operations. Restrictions against occupancy of adjacent land use and noise easements would be required to be included in any interim leases or conveyance documents.

Utilities Interdependencies. Steam heat at JPG is provided from a single source, Building 103. Conveyance of property interests south of the firing line, whether via interim leases, sale, or transfer, would require among transferees establishment of an entity to continue provision of this function for existing facilities.

Historical Resources. Pursuant to a MOA executed between the Army, the Advisory Council on Historic Preservation, and the Indiana SHPO, the JPG is to develop a final Cultural Resource Management Plan not later than September 30, 1995. In conjunction with the Cultural Resources Management Plan, land and facilities that are sold or transferred will be subject to restrictive covenants that necessitate future owners' obtaining permission of the SHPO prior to taking actions that might adversely affect archaeological resources or sites eligible for inclusion in the National Register of Historic Places.

Remediation Activities. Operations over many decades at the JPG have resulted in localized hazardous waste contamination. The contaminants and substances of concern include volatile organic compounds, semivolatile organic compounds, metals, asbestos, polychlorinated biphenyls, pesticides, and explosive wastes. Both

the northern and southern sections of the JPG bear hazards likely to warrant some degree of remedial action.

Details of remedial actions remain to be determined. Preliminary estimates available from current information indicate that several buildings and areas of the JPG would be subjected to some level of cleanup activity. Interim leases for buildings would require clauses permitting right of reentry to perform remediation-related tasks. Specific locations requiring long-term operation and maintenance of remedial measures, once certified by the U.S. EPA as being successfully commenced, would likely necessitate restrictive use covenants for the duration of the remedial action.

Reversionary Clauses. In Army-FWS transfer negotiations concerning creation of a wildlife refuge, the FWS has requested that outlying parcels intended for commercial development be burdened with a reversionary clause favoring the FWS. This would result in property not developed to some agreed level being vested in the FWS, probably after a period of 25 years. While this type of clause would appear not to impact successful commercial development, it could have an effect on a county's land use decisions respecting undeveloped parcels, especially any action that could be in conflict with the FWS's reversionary interest (e.g., a county's grant of easement for a petroleum pipeline across an undeveloped parcel).

Wetlands. As shown in Figure 49, wetlands of varying types and areal sizes occur in almost all areas of the base. To provide for wetlands protection, the Army may impose restrictive covenants prohibiting land uses that would eliminate or degrade the wetlands areas. Depending on proposed land uses, such covenants could, as well, impose a requirement for buffer zones adjoining wetlands areas.

Endangered Species. Mitigation options related to impacts on habitat occupied by or available for federally or state listed endangered or threatened species of plants or wildlife could include land use encumbrances. As discussed in sections 4.12.5 and 4.12.6, much of the land at the JPG provides habitat for several federally or state listed threatened, endangered, or special concerns species. To provide for enhanced habitat protection, the Army may impose restrictive covenants prohibiting land uses that would eliminate or degrade habitat occupied or frequented by such species. Depending on proposed land uses, such covenants could, as well, impose a requirement for buffer zones adjoining particular sensitive habitat areas.